Final Field and Data Report

Upriver Reach Sediment Characterization

Lower Willamette River
Portland, Oregon

May 8, 2018

Prepared for

State of Oregon

Department of Environmental Quality

Prepared by

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Abbreviations and Acronyms

°C	degree Celsius
ug/kg	microgram per kilogram
ALS	ALS Environmental
ASTM	American Standard Test Method
BaP	benzo(a)pyrene
BaP Eq	benzo(a)pyrene equivalent
cm	centimeter
COC	contaminant of concern
cPAH	carcinogenic PAH
CRD	Columbia River Datum
CUL	cleanup level
DDx	DDT and breakdown compounds DDD and DDE
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DEQ	Oregon Department of Environmental Quality
DSL	Oregon Department of State Lands
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
GSI	GSI Water Solutions, Inc.
GPS	global positioning system
HAZWOPER	Hazardous Waste Operations and Emergency Response
HPAH	high molecular weight PAH
ISM	incremental sampling methodology
IWWP	In-Water Work Period
LCS	laboratory control sample
JPA	Joint Permit Application
LPAH	low molecular weight PAH
MB	method blank
MDL	method detection limit
mg/kg	milligram/kilogram
mm	millimeter
MS	matrix spike
MSD	matrix spike duplicate
NAD83	North American Datum of 1983
PAH	polycyclic aromatic hydrocarbon
PBDE	polybrominated diphenyl ether
PCB	polychlorinated biphenyl
PCDD/F	polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans
Portland Harbor	Portland Harbor Superfund Site
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RAL	remedial action level
RBC	risk-based concentration
RI	Remedial Investigation

RM	river mile
TEF	toxic equivalency factor
TEQ	toxicity equivalency quotient
TOC	total organic carbon
URSC	Upriver Reach Sediment Characterization
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
VOC	volatile organic compound
WHO	World Health Organization
Work Plan	URSC Work Plan

1 Introduction

This Field and Data Report provides the results of Upriver Reach Sediment Characterization (URSC). The Upriver Reach is the most upstream portion of the Lower Willamette River, starting near the Sellwood Bridge at River Mile (RM) 16.6 and extending to Willamette Falls at approximately RM26 (Figure 1). This report describes the sampling activities and presents analytical results. The evaluation of the URSC data is limited to providing maps of the sampling locations and tables of the results. A detailed interpretation and discussion of these data are beyond the scope of this report.

1.1 Purpose and Objectives

This URSC is intended to reveal whether areas of potentially significant sediment impacts exist within the scarcely investigated 10-mile reach of the Willamette River upstream of downtown Portland. Areas characterized during this study were selected on the basis of the review of available historical data and the proximity to potential sources. The study focused on potential contaminant sources and transport pathways to the river including outfalls; areas adjacent to past or present riverfront industrial activities; land use that has the potential to impact the river, such as application of pesticides; and confluences of tributaries that may have upstream sources of contamination. Details on the selection process for characterization areas are provided in the URSC Work Plan (Work Plan; DEQ, 2017).

This URSC was not intended to be a comprehensive study of all potential contaminant sources, and it does not address all potential sources and transport pathways, such as current and historical outfalls, and industrial properties. The URSC was constrained by funding; potential source areas and data gaps were identified, and initial areas of interest were selected and prioritized on the basis of potential magnitude of impacts.

1.2 Summary of Results

The Upriver Reach has a stronger river current and coarser sediment than the downstream reaches. The hard rocky substrate limited the amount of power-grab surface sediment samples that could be collected in each of the targeted composite areas. Given the challenging substrate, sampling locations were adjusted to areas with softer sediment thereby enabling an acceptable number of grab samples to be collected in each composite area. The analytical results presented in Section 7 indicate that, with a couple minor exceptions, concentrations are below the cleanup levels (CULs) selected for the Portland Harbor Superfund Site (Portland Harbor) and are well below Portland Harbor remedial action levels (RALs).

1.3 Document Organization

This Field and Data Report is organized into the following sections:

- Section 1 – Introduction
- Section 2 – Project Organization
- Section 3 – URSC Setting and Sampling Approach
- Section 4 – Field Activities
- Section 5 – Laboratory Analysis and Quality Assurance and Quality Control
- Section 6 – Electronic Data Management

- Section 7 – Analytical Results for Surface Sediment
- Section 8 – References

Supporting information is provided in Appendices A through F.

2 Project Organization

This section summarizes the organizational structure, responsibilities, and resources employed to support the URSC. Additional details are provided in the Work Plan.

2.1 Team Organization and Responsibilities

The U.S. Environmental Protection Agency (EPA) is funding and reviewing the work. The Oregon Department of Environmental Quality (DEQ) is leading implementation of the work with assistance from its contractors, Hart Crowser and GSI Water Solutions, Inc. (GSI). Additional support was provided by the following subcontractors:

- Gravity Consulting – Operation of sampling vessel and equipment
- ALS Environmental (ALS) – Courier and physical-chemical analytical services

2.2 Health and Safety

Field activities associated with the URSC were completed in compliance with Hazardous Waste Operations and Emergency Response (HAZWOPER) regulations under Chapter 29 Code of Federal Regulations 1910.120.

2.3 Project Schedule

Sediment sampling for the URSC was conducted on five field days between November 29 and December 5, 2017. Laboratory analyses were completed during December 2017 and January 2018, and data validation was completed by late February 2018.

3 URSC Setting and Sampling Approach

While the Lower Willamette River is generally a wide, slow-moving segment that is tidally influenced, the Upriver Reach is narrower and faster moving than the downstream reach. Much of upriver reach that stretches to Willamette Falls is characterized by relatively narrow channels characterized by exposed basalt riverbanks. Because the Lower Willamette River is affected by semidiurnal tides, there may be occasional flow reversals in the Upriver Reach when river discharge is low. Land use, potential sources of contamination, and sampling rationale are summarized below, with more detail provided in the Work Plan. As used in this report, shores are consistently described as west for west/northwest shores, and east for east/southeast shores.

3.1 Land Use and Potential Sources of Contamination

The Upriver Reach of the river flows through multiple municipalities and two counties (Figure 1). Land use is largely residential and mixed use residential, with some parks and open spaces (Figure

2). Current industrial use in the Upriver Reach is limited to the Lake Oswego industrial area on the west shore between RMs 20 and 20.5, and on both shores near Willamette Falls at approximately RM26, where papermaking facilities historically have been located.

3.2 Available Data and Sampling Location Rationale

To determine sampling locations, DEQ reviewed readily available historical data on sediment, surface water, and aquatic organisms collected in the Upriver Reach to identify areas of elevated chemical impacts and areas with soft sediment accumulation. Data evaluated include the following:

- Sediment data assembled and collected by the Lower Willamette Group for the Portland Harbor Remedial Investigation (RI).
- Water and tissue data from DEQ’s toxics monitoring program.
- Dredge material and leave surface characterization reports submitted to the U.S. Army Corps of Engineers (USACE) between 2009 and 2015.
- U.S. Geological Survey (USGS) sediment data reported in the *Journal of the American Watershed Resources Association* in 2014.
- River bottom substrate information presented in the Willamette River Sediment Trend Analysis Report (GeoSea, 2001).

These data are provided in Appendix A of the Work Plan. Data Gaps and potential sources of contamination for each river mile in the Upper Reach are discussed detail in Section 3 of the Work Plan. A summary of locations selected for characterization and the basis for selection are provided in Table 1 and shown on Figure 3.

In accordance with the Work Plan, one composite sample from each sampling area was analyzed for a broad suite of chemicals including most of the Portland Harbor contaminants of concern (COCs) in sediment (Section 7).

4 Field Activities

The Work Plan specifies the procedures and methods used for sample collection, record keeping, sample handling, storage, shipping, and field quality control (QC). Sampling activities were conducted in general accordance with the Work Plan but some sample locations were adjusted or recovery requirements reduced based on field conditions as described in Section 4.5..

4.1 Permitting

Before initiating in-water investigation activities, the following authorizations were obtained from the Oregon Department of State Lands (DSL) and USACE:

- USACE/DSL Joint Permit Application (JPA) to conduct survey activities (which include sediment sampling) under Nationwide Permit No. 6 (NWP-2017-440). This permit includes a DSL Short-Term Access Agreement.
- DSL General Authorization Notification for Minimal Disturbance Activities within Essential Salmon Habitat Waters (GA 60662).

- Joint DSL/USACE In-Water Work Period (IWWP) variance to conduct sampling outside of the Lower Willamette River fish window.

4.2 Station Position and Vertical Control

Station positioning was accomplished using the Trimble RTK global positioning system (GPS) on-board Gravity Consulting's sampling vessel. Actual station coordinates are provided in Table 2 using the North American Datum of 1983 (NAD83), Oregon State Plane North Zone, in units of international feet. Sample coordinates were inadvertently not recorded at sample location URSC-RM18.45E-G009, so the target sample coordinates were used as the actual sample location, which is considered accurate to within 20 feet. Field conditions that may have affected GPS data accuracy include on-water movement of the GPS unit during satellite signal acquisition and tall vertical structures (e.g., bridges) near sample stations. Based on GPS unit specifications and field conditions, GPS coordinate data appear to be accurate to within 2 meters.

Vertical positioning was established using a lead line and/or fathometer during sample collection at each station. Depth measurements were recorded to the nearest tenth of a foot. Precision of vertical measurements depends on environmental factors, including waves and wind, river current, and water depth.

Mudline elevations were not reported on the basis of water depths because of the distance from the river gauge and the difficulty in the changing datum conversions with distance upstream; additionally, several samples were collected from shore (i.e., dry land), where no vertical measurement was collected. This calculation can be estimated if further interpretation of the URSC sample results are needed in the future. To gain a better understanding of the river bottom elevation, GSI obtained a hydrographic survey that USACE conducted in 1999, plotted the coordinates, and converted them to a bathymetry raster by using the natural neighbor interpolation tool in ArcGIS using 10-foot grid cells. Elevations (in feet) relative to the Columbia River Datum (CRD) are shown on Figure 3 for reference.

4.3 Field Documentation

Field activities were documented through grab sample photographs and description logs, which provide important information on sediment properties. Grab sample locations, collection dates and times, and penetration depths are provided in Table 2, and representative photographs of the sampling activities and substrate are included in Appendix A. Generalized sample descriptions of sediment in each composite area are included in Table 3, and copies of the grab sample description logs, which includes descriptions of each successful grab sample, are provided in Appendix B.

Field activities and observations also were documented in a bound field logbook. This logbook was used to describe information such as personnel, date, time, station designation, types of samples collected, and any observed modifications to the Work Plan. Copies of the contents of the field notebook is provided in Appendix C.

4.4 Equipment Decontamination

Equipment decontamination was performed to avoid cross-contamination between samples. Given that the samples were homogenized by ALS, equipment in direct contact with the sediment samples was minimal. The aluminum coring device or the stainless-steel spoon used to collect the sample from either the power-grab sampler or the shoreline was decontaminated between individual sample locations. That equipment and any other stainless-steel trays or spoons were decontaminated in the following manner:

- Rinse with tap (or site) water, using a brush if needed to remove particulate matter and/or surface films.
- Wash with brush and Liquinox.
- Double rinse with distilled water.
- Rinse with ethanol.
- Rinse with distilled water.

The sediment grab equipment was washed using phosphate-free detergent and rinsed with site water between individual sample locations.

4.5 Sample Collection

Nine composite samples were collected from the areas shown on Figure 3 and listed in Table 1. The composite samples included five to nine discrete grab samples. Sample locations, penetration depths, and other relevant collection details are included in Table 2.

Submerged sample locations were collected with a pneumatic power-grab sampler deployed from the sampling vessel. The power-grab sampler had a maximum penetration capability of 30 centimeters (cm). Shoreline samples were collected manually using a stainless-steel hand coring device or stainless-steel spoons or trowels. In total, 44 power-grab samples and 11 manual grab samples were collected for later laboratory compositing by sample area.

The attempted versus successful sample locations within each sample composite area are shown on Figures 4 through 10. Rocks and debris (e.g., riprap armoring or wood) on the river bottom often precluded the power-grab sampler from attaining the desired penetration and multiple attempts were required at many locations to obtain an acceptable grab sample (i.e., at least 15 cm of penetration and sufficient fine-grained material for chemical analysis). After completing at least three attempts on each individual grab sample location, typically, the station was abandoned and/or sample increments were relocated to the shoreline or other areas where softer material could be collected manually. This was the case for relocation to shoreline samples in composite areas RM18.35E (Figure 4), RM20.0E (Figure 5), RM20.4E (Figure 6), and RM24.7E (Figure 9). After consultation with the DEQ project manager, the composite sample area RM20.2E was relocated to RM20.0E because of hard ground, a lack of fine-grained sediment at the original location, and the proximity of the new location to the wastewater treatment plant discharge point (i.e., outfall). Three grab-samples with only 13 cm of recovery were also deemed to be acceptable after at least three attempts at grab sample locations RM18.35E-G005, RM18.45E-G005, and RM20.4E-G001.

If a grab sample was deemed acceptable, a representative aliquot of sediment was collected and processed in accordance with the Work Plan and as described below.

- For soft sediment, samples were collected by driving a 2-inch-diameter coring device (e.g., aluminum tube) through the center of the grab sampler and collecting material representative of the full depth of the sampler. The full sample volume was extruded from the coring device and placed into a pre-cleaned 16-ounce glass sample container labeled for inclusion in the composite sample from that sample area. A second “plug” of sediment was then collected using the same technique from within the same power-grab bucket and placed in a second pre-cleaned 16-ounce glass sample container labeled for frozen archival.

Where ammocoetes (i.e., lamprey larva) were observed within the power-grab sampler, a stainless-steel spoon was used instead of the sampling tube in attempt to minimize impact to the population and avoid accidental collection of ammocoetes in the sediment samples.

- Coarse-grained sediment was manually collected using a stainless-steel spoon, with care taken to scoop material from the full depth of the sampler. Sediment in contact with the sides of the sampler was avoided, and large rocks, organisms, and pieces of debris were removed and noted in the sample description form. Samples with significant amounts of gravel were placed into two 32-ounce jars to ensure that ALS had enough material for processing, analysis, and archival.

The following physical characteristics of the sediment were described and recorded on grab sample description forms: sediment color, odors, grab penetration depth (nearest cm), degree of sediment washing or surface disturbance, and any obvious features or characteristics, such as wood or shell fragments or aquatic organisms. Grab sample description logs are provided in Appendix B, and a general description of the river bottom substrate within each sample composite area is provided in Table 3.

4.6 Field Quality Control Samples

Field QC samples are used to assess within-station variability (e.g., replicates), evaluate the effectiveness of sample homogenization and within-sample variability (e.g., splits), evaluate potential sources of sample cross-contamination (e.g., rinsate and trip blanks), or confirm proper shipping/storage conditions (e.g., temperature blanks). As noted in the Work Plan, no field duplicates or replicates were planned for collection because of the nature of the laboratory homogenization and sample processing scheme (see Section 5.1) and project objectives. Trip blanks were also deemed unnecessary because volatile organic compounds (VOCs) were not a target analyte in this URSC.

The purpose of a rinsate blank is to assess the potential of cross-contamination of samples because of insufficient decontamination of the sampling equipment. The Work Plan indicated that one rinsate blank was to be collected at a frequency of 1 per 20 samples in each medium (i.e., at least 5 percent). Given that the URSC field work was conducted immediately upon completion of the RM 16.5 Sediment Characterization[1] field work and fewer than 20 samples were analyzed for both projects, it was decided that one rinsate blank could be collected following collection of the RM 16.5 samples, and before collection of the URSC sediment to inform both projects. The rinsate blank was prepared in the field by decontaminating reusable field sampling equipment (i.e., the aluminum core tube and a stainless-steel spoon), then rinsing the equipment with laboratory-provided distilled, deionized water, and collecting the rinsate.

Because the rinsate blank was submitted to ALS with the RM 16.5 sediment samples, the rinsate blank results were inadvertently compared only with RM 16.5 data during data validation. As shown in Table 4, there were low-level detections of 10 polychlorinated biphenyl (PCB) congeners, two polycyclic aromatic hydrocarbons (PAHs), and two pesticides in the rinsate blank. Although the URSC samples were not directly compared and evaluated to the rinsate blank results during data validation (Section 5.4), review of the URSC sample results indicated that less than 2 percent of the data would be re-qualified as non-detect (U) or estimated (J) because the rinsate blank

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[1] This work is descr bed in a separate RM 16.5 Work Plan (GSI and Hart Crowser, 2017) and Field and Data Report that is being concurrently prepared with this report.

contamination. Qualification of the URSC sample data because of the rinsate blank contamination is unlikely to significantly impact the results or the conclusions of the study and the results of the rinsate blank evaluation confirm that field decontamination procedures were sufficient in meeting project objectives.

In addition to this QC sample, a temperature blank was included in each cooler to measure and ensure cooler temperature upon receipt of samples at ALS. The receiving temperatures were within 2 to 6 degrees Celsius (°C) acceptance criteria, or were below 2°C.

4.7 Investigation-Derived Waste

Liquid and solid waste from the URSC field activities was managed as specified in the Work Plan. Excess water or sediment remaining after sampling and processing on the vessel was returned to the Willamette River near the collection site.

Limited volumes of decontamination solutions containing phosphate-free detergent and ethanol were generated during the sampling event on the vessel. These liquids were managed in sealed 5-gallon plastic buckets and were diluted and disposed of in the municipal sanitary sewer.

All disposable materials used in sample collection and processing, such as paper towels, aluminum foil, and gloves, were placed in heavyweight garbage bags before disposal as solid waste.

4.8 Sampling Handling, Transport, and Custody

Samples collected during the URSC field event were tracked from the time of sample collection through laboratory and data analysis using standard chain-of-custody and sample shipping/transfer procedures. These procedures are detailed in the Work Plan. Copies of the chain-of-custody forms are provided with the laboratory reports in Appendix D.

5 Laboratory Analysis and Quality Assurance and Quality Control

This section summarizes the physical and chemical analyses performed on sediment samples collected during the URSC. Laboratory QC and data validation protocols also are described. These protocols were followed to ensure that data quality and representation are in accordance with method requirements and that data usability is appropriately assessed for the project objectives.

5.1 Laboratory Homogenization

As discussed in Section 3, individual increments from each composite area were provided to the laboratory. Before preparing the composite sample, ALS wet-sieved out material > 2 millimeters (mm) and homogenized each grab sample; an equal mass was then taken from each increment in the composite area for use in the composite sample. Those equal mass increments were then combined for further homogenization, processing, and subsampling according to incremental sampling methodology (ISM) protocol detailed in Appendix B of the Work Plan. The intent of this structured ISM protocol was to reduce data variability, increase sample representativeness, and reduce the chance of missing significant contamination over standard field homogenization techniques.

5.2 Physical and Chemical Analysis

ALS of Kelso, Washington, performed the ISM sample processing and physical and chemical analyses on URSC samples. Composite sediment samples were analyzed for a broad suite of parameters including:

- PCB congeners – EPA Method 1668C
- Metals – EPA Method 6020A
- Mercury – EPA Method 7471B
- PAHs – EPA Method 8270D
- Diesel-Range Petroleum Hydrocarbons – NWTPH-Dx
- Organochlorine Pesticides – EPA Method 1699M
- Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/Fs) – EPA Method 1613B
- Select Phenols and Phthalates – EPA Method 8270D
- Total Solids – by Puget Sound Estuary Protocol
- Total Organic Carbon (TOC) – by Puget Sound Estuary Protocol
- Polybrominated Diphenyl Ethers (PBDEs) – EPA Method 8270C-SIM
- Condensed Grain Size – American Standard Test Method (ASTM) D422M

A separate increment from each individual grab sample location was also archived frozen at ALS for potential future analysis.

5.3 Laboratory Quality Assurance and Quality Control Procedures

Laboratory quality assurance (QA) and QC were maintained through the use of standard EPA methods and other accepted methods and standard analytical procedures for the target analytes. The method-specific and other analytical and laboratory QC procedures and protocols followed are detailed in the DEQ Quality Assurance Project Plan (QAPP; DEQ, 2012) and the contract laboratory's QA manual. These procedures incorporated the collection and analysis of the following laboratory QA/QC components:

- Internal QC samples
- Method reporting limit checks
- Method blanks (MB)
- Matrix spike (MS) and matrix spike duplicate (MSD) samples
- Laboratory control samples (LCS)
- Surrogate spikes
- Calibration curves and calibration check samples
- Laboratory duplicates

In general, the frequency and QC criteria for the laboratory QC samples met those specified in Table A7-1 of DEQ's QAPP as discussed in Appendix E (DEQ, 2012).

5.4 Data Verification, Validation, and Usability

Field and laboratory data collected for the URSC were subjected to a formal verification and validation process in accordance with EPA guidance documents as described in the Work Plan. Verification is the confirmation by examination and provision of objective evidence that specified requirements have been fulfilled. Analytical data were verified by ALS's project manager to ensure that the specified laboratory QA/QC objectives were met. All data were indicated to be usable and any limitations were identified using data qualifiers, quantitative evaluations, and narrative statements regarding potential bias.

Validation is the confirmation by examination of objective evidence that the particular requirement for a specific intended use has been fulfilled. Analytical data were validated by Hart Crowser to ensure that the specified QA/QC objectives for precision, accuracy, representativeness, completeness, and comparability were met. The data validation included review of the chain-of-custody documentation, holding times, equipment blanks, MS, LCS, duplicates, and MB samples. It also included an assessment of data quality indicators: precision, accuracy, representativeness, completeness, and comparability using data validation methods consistent with EPA guidance. Data qualifiers were assigned during data validation to the electronic data deliverables (EDD) when applicable QA/QC limits were not met and the qualification was warranted following guidance specified by EPA (1995, 2002, 2008, 2010, 2011), QC requirements specified in the Work Plan, and method-specific QC requirements, as applicable.

After verification and validation of the laboratory data, all data were deemed usable with limitations and were identified using data qualifiers, quantitative evaluations, and narrative statements regarding potential bias. Completeness for the URSC data set is 100 percent (i.e., no data were rejected). Additional detail regarding the QA review and data validation procedures is provided in Appendix E. Final, qualified laboratory results were transmitted in EDDs to GSI for data management, further evaluation, and reporting as described in Section 6 of this report.

6 Electronic Data Management

Validated laboratory results were managed in accordance with the Work Plan and specified data reduction and summation rules, consistent with those developed for Portland Harbor. Data summation was performed to generate total concentration values for respective analyte groups, including: total PCB congeners, total low and high molecular weight PAHs (i.e., LPAH and HPAH), total carcinogenic PAHs (cPAHs)[2], total DDx[3], total chlordanes, total PCDD/Fs, and dioxin/furan toxicity equivalency quotients (TEQs)[4]. Analytes contributing to the summed values and associated handling guidance are described in Section 8 of the Work Plan.

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[2] Total cPAH is the sum of benzo(a)pyrene (BaP) equivalent (BaP Eq) concentrations, which were calculated by multiplying the cPAHs by their respective potency equivalent factors (PEFs).

[3] Total DDx includes dichlorodiphenyltrichloroethane (DDT) and breakdown compounds dichlorodiphenyldichloroethane (DDD) and dichlorodiphenyldichloroethylene (DDE).

[4] Total Dioxin/Furan TEQ was calculated as the sum of each applicable congener concentration multiplied by the corresponding 2005 World Health Organization (WHO) consensus toxic equivalency factor (TEF) value for mammals (Van den Berg et al., 2006).

An Excel flat file containing all of the URSC results and calculated analyte group totals is included as Appendix F (electronic only). Because the analytical results represent a composite sample collected from between 5 and 9 discrete grab sample locations (Table 1), the location data is provided in a separate tab from the analytical data in the Appendix F Excel file. For the sake of being able to plot and/or interpolate these sample results as individual sample points in the future a "centroid" sample coordinate was developed for the composite sample. The centroids of the retained samples were calculated using the "Mean Center" tool in ArcGIS. The "Mean Center" tool identifies the geographic center (i.e. the average x and y coordinates) of all the selected features in the composite area. The actual and calculated "centroid" sample locations are shown on Figures 4 through 10.

7 Analytical Results for Surface Sediment

Surface sediment samples were collected within the target areas of RM18.35E, RM20.0E, RM20.0W, RM20.1W, RM20.4E, RM20.9W, RM24.4W, RM24.7E, and RM25.2E to create nine laboratory (ALS) composited samples as discussed in Sections 4.5 and 5.1. Note that the sampling conducted in the Upriver Reach is not representative of the Upriver Reach as a whole, but rather biased toward locations where (1) potential sources of contamination were identified, and (2) sufficient fines existed such that a surface-deployed grab sampler could successfully obtain and retain sediment.

Therefore, the expectation is that the Upriver Reach data collected as part of this effort is biased toward high percent fines, high organic carbon, and higher levels of contamination than the rest of the Upriver Reach. Grain-size, total solids, and TOC data presented in Table 5 represent the homogenized sediment samples following sieving and removal of material > 2mm (i.e., gravels). Although the URSC sample locations targeted areas with fine-grained sediment and higher TOC, the range of TOC observed in the Upriver Reach was 0.228 to 0.937 percent, which is lower than the mean (1.751 percent) and median (1.735 percent) values observed in Portland Harbor (see Figure 11).

In addition to physical parameters, laboratory-composited samples were analyzed for the Portland Harbor sediment COCs in accordance with the Work Plan, including: PCBs, PAHs, PCDD/F, DDx, Portland Harbor sediment COC metals, chlorinated pesticides, diesel-range petroleum hydrocarbons, pentachlorophenol, and bis(2-ethylhexyl) phthalate. PBDEs, which are Portland Harbor tissue COCs, were also included in the analyte list. The analytical results are presented in Table 5 and laboratory reports provided in Appendix D. With the exception of some of the PCDD/F congeners, the method detection limits (MDLs) were generally consistent with those specified in the Work Plan. Instances where MDLs were adjusted by the laboratory are noted in Appendix E.

Where applicable, analytical results were compared to the Portland Harbor CULs and RALs specified in Tables 17 and Table 21, respectively, of the Portland Harbor Record of Decision (EPA, 2017). As a preliminary screening measure, detected concentrations of Portland Harbor COCs that exceed Portland Harbor CULs are highlighted in Table 5. While the nearshore RALs for Portland Harbor focused COCs are shown for reference in Table 5, all sediment concentrations in the Upriver Reach are much lower than Portland Harbor RALs.

As shown in the Table 5, total PCBs, phthalates, diesel-range petroleum hydrocarbons, and most of the metals and pesticides had reported concentrations that were less than their associated Portland Harbor CULs in all samples. For those analytes that had marginal exceedances of CULs, concentrations were graphed and compared with Portland Harbor CULs and RALs (where applicable) and Portland Harbor mean and median concentrations (see Figures 12 through 16). A description of these graphs and analytes is provided below:

- **Arsenic (Figure 12):** While six of the eight URSC sediment samples exceed the Portland Harbor CUL, they are all similar to or less than the Portland Harbor mean and median concentrations and well below the default background concentration of 8.8 milligrams per kilogram (mg/kg) for soils located in the Portland Basin (DEQ, 2013). There does not appear to be a significant anthropogenic source of arsenic in the areas sampled.
- **PCDD/Fs (Figures 13):** While 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and 1,2,3,7,8-pentachlorodibenzo-p-dioxin (PeCDD) have detected and non-detected concentrations that slightly exceed Portland Harbor CULs (Table 5), the detections observed are low. To get a better understanding of how combined PCDD/F concentrations compare to those observed in Portland Harbor, Figure 13 was prepared to show the total dioxin/furan TEQ. As illustrated in Figure 13, all sample locations have PCDD/F TEQ concentrations that are below the mean and median values observed in Portland Harbor.
- **Dieldrin (Figure 14):** The detection limit for dieldrin was elevated slightly above the Portland Harbor CUL. The dieldrin detections in composite areas RM18.35E and RM20.0E are both below the Portland Harbor mean and median values.
- **cPAHs (Figure 15):** While six of the eight URSC sediment samples exceed the Portland Harbor CUL for total cPAHs [calculated as benzo(a)pyrene equivalent], all but one of those are less than the Portland Harbor mean and median values and less than the risk-based concentration (RBC) for direct contact in shoreline sediment of 85 micrograms per kilogram (ug/kg)[5]. While the concentration in the sediment sample from composite area RM20.0E exceeds this RBC and the Portland Harbor median concentration, it is less than the mean value observed in Portland Harbor sediment.

Although sediment CULs and Portland Harbor sediment statistics are not available for PBDEs, Figure 16 is provided to compare select PBDE results between URSC sample locations. As shown in Table 5 and Figure 16, one or more PBDEs were detected in most of the URSC samples with the highest concentrations observed at RM20.0E.

The analytical results presented in in this section indicate that, with a couple minor exceptions, sediment concentrations in the Upriver Reach are below Portland Harbor CULs and the mean and median sediment concentrations observed in Portland Harbor. In addition, concentrations of the Portland Harbor Focused COCs are well below Portland Harbor RALs, indicating that they are below levels that would warrant active remediation in Portland Harbor.

8 References

DEQ. 2012. Quality Assurance Project Plan for Oregon Department of Environmental Quality (DEQ) EPA PA/SI Investigations (DEQ05-LQ-069-QAPP [ver.2.2]).

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[5] Represents a seven-fold increase of the Portland Harbor CUL based on the January 2017 EPA Integrated Risk Information System (IRIS) toxicity update.

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Table 1. Project Objectives and Basis for Sample Selection

Area of Interest	Composite Area ID	Basis for Sample Selection
Johnson Creek Confluence	RM18.35E	Multiple potential point and non-point sources of contamination may be present in Johnson Creek. A historical carp sample collected nearby in the Willamette River had elevated levels of PCBs and pesticides. Sediment data have not previously been collected in this area for Portland Harbor COCs. River bottom substrate appears to be composed of some fines.
Kellogg Creek Confluence and WWTP	RM18.45E	Multiple potential point and non-point sources of contamination may be present in Kellogg Creek and a WWTP discharges at this location. A historical carp sample collected nearby in the Willamette River had elevated levels of PCBs and pesticides. Sediment data have not previously been collected in this area for Portland Harbor COCs. River bottom substrate appears to be composed of some fines.
Oak Lodge Water Reclamation Facility	RM20.0E	A small mouth bass sample collected approximately 1 mile upstream had elevated PCBs and DDx. No historical samples were collected in this area. A WWTP discharges in this vicinity. Note this sample location was formerly designated at RM20.1E but moved to RM20.0E due to the availability of soft sediment and the proximity of the Oak Lodge Water Reclamation Facility discharge location.
Tryon Creek Confluence	RM20.0W	Tyron Creek discharges in this area and USGS sediment sampling indicates accumulation of contaminants (mostly pharmaceuticals) in the vicinity. Further, the Tryon Creek WWTP discharges at this location. The area appears to be depositional. The area warrants further evaluation for additional contaminants.
Lake Oswego Industrial Area	RM20.1W	Multiple DEQ cleanup sites are in this area, including ECSI 71 Martin Electronic where a release of PCBs resulted in significant soil contamination. While the site was remediated, no historical sample collection in-water has been identified in this area and the river substrate appears to have some areas of sand and muddy sand, indicating sufficient fines are available to accumulate potential contamination.
Oak Lodge Water Reclamation Facility	RM20.1E	A small mouth bass sample collected approximately 1 mile upstream had elevated PCBs and DDx. No historical samples were collected in this area. A WWTP discharges in this vicinity.
Forest Creek Confluence	RM20.4E	A small mouth bass sample collected approximately 1 mile upstream had elevated PCBs and DDx. No historical samples were collected in this area. Forest Creek discharges a small lake, River Forest Lake, which discharges to the Willamette River.
Lake Oswego Discharge	RM20.9W	Lake Oswego discharges at this location and there appears to be an accumulation of fines in the area. No sediment data are available in this area.
Clackamas River Confluence	RM24.7E	The Clackamas River discharges to the Willamette River in this location and there is some accumulation of sand on the east shore. While historical samples show only a minimally elevated concentration of PAHs, a comprehensive analysis was not conducted (e.g., PCBs were not analyzed).
Downstream of Willamette Falls	RM25.2E	Multiple outfalls, a WWTP, and Abernathy Creek discharge in this area. Further, multiple DEQ cleanup sites are located on both shores and upriver. While river bottom substrate has historically been described as hard ground, an area of river widening and potential lower velocities and settling of sediment is targeted for characterization. If sufficient fines are available for sampling at the selected area, field reconnaissance will be conducted to find accumulated sediment between RMs 25 and 26 for sampling and analysis.

Notes:
WWTP = Wastewater Treatment Plant

Table 2. Sample Collection, Location, and Analysis Summary

Composite Area	Number of Points in Composite	Sample ID	Lab Sample ID	Map Label	Sample Type	Sample Coordinates[1]		Sample Date	Sample Time	Water Depth (ft)	Start Depth (cm)	End Depth (cm)	Archive Only	Full Suite
						Easting	Northing							
RM18.35E	5	URSC-RM18.35E-COMP	K1713130-006	--	Composite[2]	7651779.9	655435.7	11/29/2017	1448	--	--	--		X
		URSC-RM18.35E-G005	K1713130-002	G5	Power-Grab	7651739.5	655451.3	11/29/2017	1539	4	0	13	X	
		URSC-RM18.35E-G008	K1713130-001	G8	Power-Grab	7651836.3	655306.7	11/29/2017	1440	9.8	0	15	X	
		URSC-RM18.35E-G011	K1713130-003	G11	Manual Grab	7651836.2	655463.9	12/5/2017	1210	N/A	0	30	X	
		URSC-RM18.35E-G012	K1713130-004	G12	Manual Grab	7651767.9	655465.0	12/5/2017	1230	N/A	0	15	X	
		URSC-RM18.35E-G013	K1713130-005	G13	Manual Grab	7651719.8	655491.5	12/5/2017	1300	N/A	0	15	X	
RM18.45E	8	URSC-RM18.45E-COMP	K1712961-015	--	Composite[2]	7652025.3	654523.2	11/30/2017	815	--	--	--		X
		URSC-RM18.45E-G001	K1712961-007	G1	Power-Grab	7652043.3	654649.9	11/30/2017	811	8	0	20	X	
		URSC-RM18.45E-G002	K1712961-008	G2	Power-Grab	7652007.8	654592.9	11/30/2017	832	22	0	22	X	
		URSC-RM18.45E-G003	K1712961-009	G3	Power-Grab	7652086.8	654546.5	11/30/2017	906	4.3	0	15	X	
		URSC-RM18.45E-G004	K1712961-010	G4	Power-Grab	7652025.3	654498.7	11/30/2017	924	21.5	0	20	X	
		URSC-RM18.45E-G005	K1712961-011	G5	Power-Grab	7651949.9	654523.0	11/30/2017	1018	47	0	13	X	
		URSC-RM18.45E-G006	K1712961-012	G6	Power-Grab	7652065.4	654438.6	11/30/2017	1027	8	0	27	X	
		URSC-RM18.45E-G007	K1712961-013	G7	Power-Grab	7652006.5	654412.9	11/30/2017	1053	24	0	17	X	
		URSC-RM18.45E-G009[3]	K1712961-014	G9	Power-Grab	7652029.9	654338.1	11/30/2017	1516	12.1	0	26	X	
RM20.0E	5	URSC-RM20.0E-COMP	K1713130-032	--	Composite[2]	7649455.6	648526.0	12/5/2017	1035	--	--	--		X
		URSC-RM20.0E-G001	K1713130-027	G1	Power-Grab	7649459.4	648588.2	12/5/2017	1035	10	0	15	X	
		URSC-RM20.0E-G002	K1713130-028	G2	Manual Grab	7649410.7	648474.6	12/5/2017	1125	N/A	0	30	X	
		URSC-RM20.0E-G003	K1713130-029	G3	Manual Grab	7649569.4	648610.5	12/5/2017	1110	N/A	0	30	X	
		URSC-RM20.0E-G004	K1713130-030	G4	Manual Grab	7649344.6	648421.8	12/5/2017	1035	N/A	0	30	X	
		URSC-RM20.0E-G005	K1713130-031	G5	Manual Grab	7649493.8	648534.7	12/5/2017	1055	N/A	0	25	X	
RM20.0W	5	URSC-RM20.0W-COMP	K1712961-006	--	Composite[2]	7648302.6	647740.5	11/30/2017	1330	--	--	--		X
		URSC-RM20.0W-G001	K1712961-001	G1	Power-Grab	7648237.2	647886.2	11/30/2017	1326	8.8	0	20	X	
		URSC-RM20.0W-G002	K1712961-002	G2	Power-Grab	7648152.0	647751.5	11/30/2017	1349	13.5	0	18	X	
		URSC-RM20.0W-G003	K1712961-003	G3	Power-Grab	7648428.0	647796.5	11/30/2017	1403	45	0	24	X	
		URSC-RM20.0W-G004	K1712961-004	G4	Power-Grab	7648276.8	647636.9	11/30/2017	1424	6.5	0	20	X	
		URSC-RM20.0W-G005	K1712961-005	G5	Power-Grab	7648418.8	647631.5	11/30/2017	1447	55	0	20	X	
RM20.1W	9	URSC-RM20.1W-COMP	K1713018-010	--	Composite[2]	7648512.2	646897.8	12/1/2017	800	--	--	--		X
		URSC-RM20.1W-G001	K1713018-001	G1	Power-Grab	7648370.0	647438.5	12/1/2017	800	5	0	21	X	
		URSC-RM20.1W-G002	K1713018-002	G2	Power-Grab	7648469.1	647352.3	12/1/2017	815	36	0	18	X	
		URSC-RM20.1W-G003	K1713018-003	G3	Power-Grab	7648440.0	647219.7	12/1/2017	835	10	0	27	X	
		URSC-RM20.1W-G004	K1713018-004	G4	Power-Grab	7648496.2	647105.6	12/1/2017	919	17.5	0	26	X	
		URSC-RM20.1W-G005	K1713018-005	G5	Power-Grab	7648504.9	646966.1	12/1/2017	932	5.5	0	17	X	
		URSC-RM20.1W-G007	K1713018-006	G7	Power-Grab	7648571.5	646711.6	12/1/2017	1015	23	0	30	X	
		URSC-RM20.1W-G008	K1713018-007	G8	Power-Grab	7648576.2	646573.5	12/1/2017	1037	21.5	0	24	X	
		URSC-RM20.1W-G009	K1713018-008	G9	Power-Grab	7648584.1	646433.0	12/1/2017	1053	30.5	0	26	X	
		URSC-RM20.1W-G010	K1713018-009	G10	Power-Grab	7648597.8	646279.8	12/1/2017	1118	43.4	0	20	X	
RM20.4E	5	URSC-RM20.4E-COMP	K1713018-016	--	Composite[2]	7648854.5	645255.3	12/1/2017	1228	--	--	--		X
		URSC-RM20.4E-G001	K1713018-011	G1	Power-Grab	7648839.4	645371.1	12/1/2017	1228	20	0	13	X	
		URSC-RM20.4E-G002	K1713018-012	G2	Manual Grab	7648918.7	645320.4	12/1/2017	1240	N/A	0	30	X	
		URSC-RM20.4E-G003	K1713018-013	G3	Manual Grab	7648873.9	645210.2	12/1/2017	1310	N/A	0	30	X	
		URSC-RM20.4E-G004	K1713018-014	G4	Power-Grab	7648756.9	645220.4	12/1/2017	1330	18	0	21	X	
		URSC-RM20.4E-G005	K1713018-015	G5	Power-Grab	7648799.8	645134.6	12/1/2017	1348	6	0	19	X	

Table 2. Sample Collection, Location, and Analysis Summary

Composite Area	Number of Points in Composite	Sample ID	Lab Sample ID	Map Label	Sample Type	Sample Coordinates[1]		Sample Date	Sample Time	Water Depth (ft)	Start Depth (cm)	End Depth (cm)	Archive Only	Full Suite
						Easting	Northing							
RM20.9W	8	URSC-RM20.9W-COMP	K1713130-015	--	Composite [2]	7647683.6	642933.3	12/1/2017	1413	--	--	--		X
		URSC-RM20.9W-G001	K1713130-007	G1	Power-Grab	7647611.0	643059.6	12/1/2017	1413	5	0	16	X	
		URSC-RM20.9W-G002	K1713130-008	G2	Power-Grab	7647684.2	643002.6	12/1/2017	1440	21	0	20	X	
		URSC-RM20.9W-G003	K1713130-009	G3	Power-Grab	7647648.1	642985.4	12/1/2017	1500	8	0	17	X	
		URSC-RM20.9W-G004	K1713130-010	G4	Power-Grab	7647597.0	642924.6	12/1/2017	1515	3	0	15	X	
		URSC-RM20.9W-G005	K1713130-011	G5	Power-Grab	7647712.9	642942.0	12/1/2017	1532	15	0	21	X	
		URSC-RM20.9W-G007	K1713130-012	G7	Power-Grab	7647779.3	642904.1	12/4/2017	815	23	0	18	X	
		URSC-RM20.9W-G008	K1713130-013	G8	Power-Grab	7647738.9	642841.8	12/4/2017	835	10	0	18	X	
		URSC-RM20.9W-G010	K1713130-014	G10	Power-Grab	7647697.1	642806.4	12/4/2017	928	6.5	0	15	X	
RM24.7E	5	URSC-RM24.7E-COMP	K1713130-021	--	Composite [2]	7660466.0	629230.0	12/4/2017	1042	--	--	--		X
		URSC-RM24.7E-G001	K1713130-016	G1	Manual Grab	7660477.7	629239.2	12/4/2017	1042	N/A	0	22	X	
		URSC-RM24.7E-G002	K1713130-017	G2	Manual Grab	7660507.2	629214.9	12/4/2017	1100	N/A	0	22	X	
		URSC-RM24.7E-G003	K1713130-018	G3	Power-Grab	7660458.0	629214.2	12/4/2017	1120	5	0	15	X	
		URSC-RM24.7E-G004	K1713130-019	G4	Power-Grab	7660423.4	629239.1	12/4/2017	1148	4	0	20	X	
		URSC-RM24.7E-G005	K1713130-020	G5	Power-Grab	7660411.0	629248.2	12/4/2017	1206	3	0	20	X	
RM25.2E	5	URSC-RM25.2E-COMP	K1713130-033	--	Composite [2]	7661756.1	625940.7	12/4/2017	1300	--	--	--		X
		URSC-RM25.2E-G001	K1713130-022	G1	Power-Grab	7661845.0	626353.7	12/4/2017	1300	15	0	15	X	
		URSC-RM25.2E-G002	K1713130-026	G2	Power-Grab	7661875.0	626269.6	12/5/2017	843	16	0	20	X	
		URSC-RM25.2E-G003	K1713130-023	G3	Power-Grab	7661926.9	626216.2	12/4/2017	1335	NC	0	28	X	
		URSC-RM25.2E-G004	K1713130-024	G4	Power-Grab	7661753.6	625877.6	12/4/2017	1420	17	0	16	X	
		URSC-RM25.2E-G010	K1713130-025	G10	Power-Grab	7661379.9	624986.5	12/5/2017	809	7	0	17	X	

Notes:
-- = Not Applicable
1 Northing and easting coordinates exist in the following coordinate system: North American Datum of 1983 (NAD83), Oregon State Plane North Zone, in units of international feet.
2 The composite sample coordinates represent the "centroid" of the successful grab sample locations. These coordinates were calculated using the “Mean Center” tool in ArcGIS, which identifies the geographic center (i.e
3 Sample coordinates were not collected at this station and the target coordinate is used as the actual sample location. There is therefore some uncertainty in the actual

Table 3. Sediment Description

Composite Area	Number of Points in Composite	Sediment Description
RM18.35E	5	Silt, Sand, and Gravel. Offshore locations encountered hard ground and cobbles. Juvenile lamprey observed at sample location G-7 and a Sculpin was recovered at G-5. No field indications of contamination.
RM18.45E	8	Silt, Sand, Sand with silt, and debris including wood fragments, garbage, and organic material. No field indications of contamination.
RM20.0E	5	Sand and silty Sand with scattered organic material including woody debris. No field indications of contamination observed.
RM20.0W	5	Sand and Gravel, trace silt, with scattered wood debris. Ammocoetes observed at sample locations G-2 and G-3. No field indications of contamination.
RM20.1W	9	Fine Sand and Silt, with scattered organic debris. Ammocoetes observed at sample location G-3. No field indications of contamination.
RM20.4E	5	Silt, Clay, and Sand, with trace gravel and scattered organic debris.
RM20.9W	8	Silt, Clay, and Sand with scattered leaves. One ammocoete observed at G-2. No field indications of contamination.
RM24.7E	5	Sand with clay. Ammocoetes observed at locations G-3, G-4, and G-5. No field indications of contamination.
RM25.2E	5	Sand with silt and Silt with trace organics including twigs, leaves, and wood. One ammocoete observed at sample location G-1. No field indications of contamination.

Table 4. Analytical Results for the Rinsate Blank

Analyte	Unit	Rinsate Blank
Conventionals		
Total organic carbon	mg/l	0.07 U
Metals		
Arsenic	ug/l	0.09 U
Cadmium	ug/l	**0.009 J**
Chromium	ug/l	**0.04 J**
Copper	ug/l	0.04 U
Lead	ug/l	0.011 U
Manganese	ug/l	0.06 U
Mercury	ug/l	0.02 UJ
Nickel	ug/l	0.04 U
Zinc	ug/l	**0.6 J**
Butyltins		
n-Butyltin	ug/l	0.029 UJ
Di-n-butyltin	ug/l	0.0073 UJ
Tri-n-butyltin	ug/l	0.012 UJ
Tetrabutyltin	ug/l	0.038 UJ
Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/Fs)		
1,2,3,4,6,7,8-Heptachlorodibenzofuran	pg/l	0.836 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	pg/l	1.52 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran	pg/l	1.14 U
1,2,3,4,7,8-Hexachlorodibenzofuran	pg/l	1.02 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	pg/l	1.54 U
1,2,3,6,7,8-Hexachlorodibenzofuran	pg/l	0.992 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	pg/l	1.61 U
1,2,3,7,8,9-Hexachlorodibenzofuran	pg/l	1.25 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	pg/l	1.5 U
1,2,3,7,8-Pentachlorodibenzofuran	pg/l	1.8 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	pg/l	1.5 U
2,3,4,6,7,8-Hexachlorodibenzofuran	pg/l	1.03 U
2,3,4,7,8-Pentachlorodibenzofuran	pg/l	1.79 U
2,3,7,8-Tetrachlorodibenzofuran	pg/l	4.42 U
2,3,7,8-Tetrachlorodibenzo-p-dioxin	pg/l	3.55 U
GSI Total PCDD/F (U=1/2)	pg/l	11.2 UT
GSI Total Dioxin/Furan TEQ-Mammalian (U=1/2)	pg/l	3.55 UT
Petroleum		
Diesel Range Hydrocarbons	ug/l	13 U
Residual Range Hydrocarbons	ug/l	27 U
Pesticides		
2,4'-DDD	ng/l	0.13 U
2,4'-DDE	ng/l	0.16 U
2,4'-DDT	ng/l	0.17 U
4,4'-DDD	ng/l	0.32 U
4,4'-DDE	ng/l	0.30 U
4,4'-DDT	ng/l	0.79 U
GSI Total 2,4-DDx (U=1/2)	ng/l	0.17 UT
GSI Total 4,4-DDx (U=1/2)	ng/l	0.79 UT
GSI Total DDD (U=1/2)	ng/l	0.32 UT
GSI Total DDE (U=1/2)	ng/l	0.30 UT

Table 4. Analytical Results for the Rinsate Blank

Analyte	Unit	Rinsate Blank
GSI Total DDT (U=1/2)	ng/l	0.79 UT
GSI Total DDx (U=1/2)	ng/l	0.79 UT
alpha-Chlordane	ng/l	0.15 U
cis-Nonachlor	ng/l	0.19 U
gamma-Chlordane	ng/l	0.22 U
trans-Nonachlor	ng/l	0.18 U
Oxychlordane	ng/l	2.2 U
GSI Total Chlordane (U=1/2)	ng/l	2.2 UT
alpha-Endosulfan	ng/l	0.88 U
beta-Endosulfan	ng/l	0.51 U
Endosulfan sulfate	ng/l	0.088 U
GSI Total Endosulfan (U=1/2)	ng/l	0.88 UT
Aldrin	ng/l	0.51 U
alpha-Hexachlorocyclohexane	ng/l	0.52 U
beta-Hexachlorocyclohexane	ng/l	0.15 U
Chlorpyrifos	ng/l	0.4 U
delta-Hexachlorocyclohexane	ng/l	0.3 U
Dieldrin	ng/l	0.82 U
Endrin	ng/l	0.7 U
Endrin aldehyde	ng/l	0.42 U
Endrin ketone	ng/l	0.27 U
gamma-Hexachlorocyclohexane	ng/l	**0.7**
Heptachlor	ng/l	0.39 U
Heptachlor epoxide	ng/l	0.21 U
Isodrin	ng/l	0.42 U
Methoxychlor	ng/l	0.11 U
Mirex	ng/l	0.21 U
SVOCs/Pesticides		
Hexachlorobenzene	ng/l	0.3 U
Hexachlorobenzene	ug/l	0.022 U
Phthalates		
Bis(2-ethylhexyl) phthalate	ug/l	0.24 U
Phenols		
Pentachlorophenol	ug/l	0.34 U
Polycyclic Aromatic Hydrocarbons (PAHs)		
2-Methylnaphthalene	ug/l	**0.030 J**
Acenaphthene	ug/l	0.026 U
Acenaphthylene	ug/l	0.015 U
Anthracene	ug/l	0.024 U
Benz(a)anthracene	ug/l	0.018 U
Benzo(a)pyrene	ug/l	0.031 U
Benzo(b)fluoranthene	ug/l	0.017 U
Benzo(g,h,i)perylene	ug/l	0.019 U
Benzo(k)fluoranthene	ug/l	0.024 U
Chrysene	ug/l	0.028 U
Dibenz(a,h)anthracene	ug/l	0.017 U
Fluoranthene	ug/l	0.020 U
Fluorene	ug/l	0.027 U
Indeno(1,2,3-cd)pyrene	ug/l	0.021 U

Table 4. Analytical Results for the Rinsate Blank

Analyte	Unit	Rinsate Blank
Naphthalene	ug/l	**0.100 J**
Phenanthrene	ug/l	0.022 U
Pyrene	ug/l	0.019 U
GSI Total LPAH (U=1/2)	ug/l	0.19 **JT**
GSI Total HPAH (U=1/2)	ug/l	0.031 UT
GSI Total PAH (U=1/2)	ug/l	0.29 **JT**
GSI Total cPAH (BaPeq) (U=1/2)	ug/l	0.031 UT
Polychlorinated Biphenyls (PCBs)		
PCB 1	pg/l	39 U
PCB 2	pg/l	41.1 U
PCB 3	pg/l	50.2 U
PCB 4	pg/l	52.5 U
PCB 5	pg/l	15.9 U
PCB 6	pg/l	15.3 U
PCB 7	pg/l	14.3 U
PCB 8	pg/l	**58.4**
PCB 9	pg/l	15.9 U
PCB 10	pg/l	31.5 U
PCB 11	pg/l	**54.3 J**
PCBs 12 + 13	pg/l	15 U
PCB 14	pg/l	15.6 U
PCB 15	pg/l	18.3 U
PCB 16	pg/l	124 U
PCB 17	pg/l	113 U
PCBs 18 + 30	pg/l	96.3 U
PCB 19	pg/l	126 U
PCBs 20 + 28	pg/l	94.5 U
PCBs 21 + 33	pg/l	90.3 U
PCB 22	pg/l	95.6 U
PCB 23	pg/l	91.5 U
PCB 24	pg/l	80.5 U
PCB 25	pg/l	82.9 U
PCBs 26 + 29	pg/l	94.6 U
PCB 27	pg/l	84.5 U
PCB 31	pg/l	94.6 U
PCB 32	pg/l	79.4 U
PCB 34	pg/l	99 U
PCB 35	pg/l	107 U
PCB 36	pg/l	93.5 U
PCB 37	pg/l	128 U
PCB 38	pg/l	107 U
PCB 39	pg/l	89.9 U
PCBs 41 + 71 + 40	pg/l	57.3 U
PCB 42	pg/l	58.4 U
PCBs 43 + 73	pg/l	50.7 U
PCBs 44 + 47 + 65	pg/l	**55.5 J**
PCBs 45 + 51	pg/l	59.6 U
PCB 46	pg/l	66.5 U
PCB 48	pg/l	54.4 U
PCBs 49 + 69	pg/l	49.2 U

Table 4. Analytical Results for the Rinsate Blank

Analyte	Unit	Rinsate Blank
PCBs 50 + 53	pg/l	56.4 U
PCB 52	pg/l	**75.9 J**
PCB 54	pg/l	81.7 U
PCB 55	pg/l	47.7 U
PCB 56	pg/l	54.1 U
PCB 57	pg/l	50.3 U
PCB 58	pg/l	45.7 U
PCBs 59 + 62 + 75	pg/l	43.6 U
PCB 60	pg/l	53.5 U
PCB 63	pg/l	47.9 U
PCB 64	pg/l	41.3 U
PCB 66	pg/l	49.5 U
PCB 67	pg/l	42.1 U
PCB 68	pg/l	41.4 U
PCBs 70 + 61 + 74 + 76	pg/l	43.7 U
PCB 72	pg/l	45.8 U
PCB 77	pg/l	80.5 U
PCB 78	pg/l	63.2 U
PCB 79	pg/l	56.4 U
PCB 80	pg/l	47.4 U
PCB 81	pg/l	85.7 U
PCB 82	pg/l	84.9 U
PCBs 83 + 99	pg/l	63.2 U
PCB 84	pg/l	56.2 U
PCBs 85 + 116 + 117	pg/l	53.3 U
PCBs 86 + 87 + 97 + 109 + 119 + 125	pg/l	53.7 U
PCBs 88 + 91	pg/l	51.2 U
PCB 89	pg/l	58.7 U
PCBs 90 + 101 + 113	pg/l	**61.9 J**
PCB 92	pg/l	66.1 U
PCB 94	pg/l	51.9 U
PCBs 95 + 93 + 100	pg/l	49.4 U
PCB 96	pg/l	40.1 U
PCBs 98 + 102	pg/l	48.4 U
PCB 103	pg/l	47.5 U
PCB 104	pg/l	62.8 U
PCB 105	pg/l	55.3 U
PCB 106	pg/l	49.8 U
PCB 107	pg/l	45.6 U
PCBs 108 + 124	pg/l	47.1 U
PCBs 110 + 115	pg/l	**69.8 J**
PCB 111	pg/l	47.8 U
PCB 112	pg/l	45.7 U
PCB 114	pg/l	52.6 U
PCB 118	pg/l	**66.5 J**
PCB 120	pg/l	50.3 U
PCB 121	pg/l	45.2 U
PCB 122	pg/l	53.6 U
PCB 123	pg/l	53.5 U
PCB 126	pg/l	59.9 U

Table 4. Analytical Results for the Rinsate Blank

Analyte	Unit	Rinsate Blank
PCB 127	pg/l	53.8 U
PCBs 128 + 166	pg/l	42.4 U
PCBs 129 + 138 + 163	pg/l	**87.3 J**
PCB 130	pg/l	56.2 U
PCB 131	pg/l	48.6 U
PCB 132	pg/l	49 U
PCB 133	pg/l	51.6 U
PCB 134	pg/l	49.4 U
PCBs 135 + 151 + 154	pg/l	45.4 U
PCB 136	pg/l	38.2 U
PCB 137	pg/l	45.3 U
PCBs 139 + 140	pg/l	42.1 U
PCB 141	pg/l	45.8 U
PCB 142	pg/l	53.2 U
PCB 143	pg/l	51.8 U
PCB 144	pg/l	49.4 U
PCB 145	pg/l	35.6 U
PCB 146	pg/l	42.5 U
PCBs 147 + 149	pg/l	43.4 U
PCB 148	pg/l	50.8 U
PCB 150	pg/l	33.5 U
PCB 152	pg/l	37.8 U
PCBs 153 + 168	pg/l	**67 J**
PCB 155	pg/l	58.4 U
PCBs 156 + 157	pg/l	72.9 U
PCB 158	pg/l	33.6 U
PCB 159	pg/l	56 U
PCB 160	pg/l	25 U
PCB 161	pg/l	37.8 U
PCB 162	pg/l	49.2 U
PCB 164	pg/l	37.2 U
PCB 165	pg/l	37 U
PCB 167	pg/l	48.5 U
PCB 169	pg/l	58.9 U
PCB 170	pg/l	103 U
PCBs 171 + 173	pg/l	88.6 U
PCB 172	pg/l	99.4 U
PCB 174	pg/l	82 U
PCB 175	pg/l	73.5 U
PCB 176	pg/l	57.5 U
PCB 177	pg/l	94.2 U
PCB 178	pg/l	76.4 U
PCB 179	pg/l	55.4 U
PCBs 180 + 193	pg/l	73.5 U
PCB 181	pg/l	81.1 U
PCB 182	pg/l	67.7 U
PCBs 183 + 185	pg/l	83.1 U
PCB 184	pg/l	49 U
PCB 186	pg/l	53.6 U
PCB 187	pg/l	63.8 U

Table 4. Analytical Results for the Rinsate Blank

Analyte	Unit	Rinsate Blank
PCB 188	pg/l	75.7 U
PCB 189	pg/l	74.9 U
PCB 190	pg/l	72.6 U
PCB 191	pg/l	74.6 U
PCB 192	pg/l	70.8 U
PCB 194	pg/l	75.7 U
PCB 195	pg/l	78.6 U
PCB 196	pg/l	73.3 U
PCB 197	pg/l	47.6 U
PCBs 198 + 199	pg/l	69.6 U
PCB 200	pg/l	52.8 U
PCB 201	pg/l	51.5 U
PCB 202	pg/l	56.8 U
PCB 203	pg/l	61.5 U
PCB 204	pg/l	53.4 U
PCB 205	pg/l	68.9 U
PCB 206	pg/l	101 U
PCB 207	pg/l	67.6 U
PCB 208	pg/l	73.5 U
PCB 209	pg/l	**949**
GSI Total PCB Congeners (U=1/2)	pg/l	**6,120 JT**
Polybrominated Diphenyl Ethers (PBDEs)		
PBDE 17	ng/l	0.19 U
PBDE 28	ng/l	0.28 U
PBDE 47	ng/l	0.16 U
PBDE 66	ng/l	0.21 U
PBDE 71	ng/l	0.17 U
PBDE 85	ng/l	0.37 U
PBDE 99	ng/l	0.34 U
PBDE 100	ng/l	0.11 U
PBDE 128	ng/l	0.14 U
PBDE 153	ng/l	0.097 U
PBDE 154	ng/l	0.15 U
PBDE 183	ng/l	0.11 U
PBDE 190	ng/l	0.38 U
PBDE 203	ng/l	0.37 U
PBDE 206	ng/l	0.27 U
PBDE 209	ng/l	0.83 U

Notes:
Bold values indicated detected results.
"GSI Total" indicates analyte group calculations performed by GSI Water Solutions. Summations were performed in accordance with the rules specified in the Final Work Plan.

Table 5. Analytical Results for Surface Sediment

Analyte	Unit	Portland Harbor Cleanup Level [1]	Portland Harbor Nearshore RAL [2]	URSC Composite Sample Results								
				RM18.35E	RM18.45E	RM20.0E	RM20.0W	RM20.1W	RM20.4E	RM20.9W	RM24.7E	RM25.2E
Conventionals												
Solids, Total	percent	--	--	68.5	61.5	74.7	70.9	60.6	71.3	69.5	70.7	65.1
Total organic carbon	percent	--	--	0.881	0.937	0.343	0.476	0.922	0.228	0.485	0.255	0.866
Grain Size [3]												
Clay	percent	--	--	4.68	3.62	3.93	2.93	5.06	6.72	2.04	3.23	4.61
Silt	percent	--	--	21.85	22.93	12.63	13.84	24.62	19.08	10.67	7.52	22.56
GSI Total Fines	percent	--	--	26.53 T	26.55 T	16.56 T	16.77 T	29.68 T	25.8 T	12.71 T	10.75 T	27.17 T
Very fine sand	percent	--	--	7.25	9.36	5.65	6.44	10.68	5.28	4.25	3.63	8.18
Fine sand	percent	--	--	36.07	49.25	43.04	29.33	48	45.21	33.72	54.48	34.65
Medium sand	percent	--	--	13.35	13.29	32.78	27.08	12.25	20.48	36.85	28.74	17.06
Coarse sand	percent	--	--	8.71	1.22	2.44	11.71	0.86	4.9	12.15	3.4	10.1
Very coarse sand	percent	--	--	8.7	0.24	0.15	9.46	0.06	0.39	0.52	0.25	2.28
Fine Gravel	percent	--	--	0.07	0	0	0	0	0	0	0	0
Medium Gravel	percent	--	--	0	0	0	0	0	0	0	0	0
Metals												
Arsenic	mg/kg	3	--	3.61	2.92	2.93	4.7	3.58	3.33	3.3	2.68	4.06
Cadmium	mg/kg	0.51	--	0.105	0.087	0.07	0.085	0.118	0.074	0.067	0.049	0.102
Chromium	mg/kg	--	--	23.2	21.4	27.7	23.8	26.3	26	18.8	20.9	25
Copper	mg/kg	359	--	24.4	19.4	18.3	16.8	24.3	20.4	17.3	17.1	18.5
Lead	mg/kg	196	--	26.7 J	12.3	12.3	22.3	14.6	8.34	8.31	6.45	16.9
Manganese	mg/kg	--	--	456	384	356	456	480	352	366	308	410
Mercury	mg/kg	0.085	--	0.02	0.027	0.016 J	0.016 J	0.028	0.017 J	0.015 J	0.015 J	0.026
Nickel	mg/kg	--	--	23.3	20.4	27.5	18.8	24.7	23	19.2	18.7	21.3
Zinc	mg/kg	459	--	80.7	64.6	61.7	82.7	74.4	57	56.8	48	72.8
Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/Fs)												
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ng/kg	0.2	0.6	0.453 U	0.232 U	0.233 U	0.193 U	0.193 U	0.771 U	0.249 U	0.197 U	0.29 J
2,3,7,8-Tetrachlorodibenzofuran	ng/kg	0.4	--	0.279 U	0.118 U	0.124 U	0.104 U	0.176 U	0.544 U	0.137 U	0.13 U	0.179 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	ng/kg	0.2	0.8	0.193 U	0.245 J	0.083 U	0.226 U	0.133 U	0.212 U	0.116 U	0.0879 U	0.404 J
1,2,3,7,8-Pentachlorodibenzofuran	ng/kg	--	--	0.182 U	0.213 J	0.103 U	0.195 J	0.132 U	0.272 U	0.117 U	0.0771 U	0.195 J
2,3,4,7,8-Pentachlorodibenzofuran	ng/kg	0.3	200	0.182 U	0.268 U	0.104 U	0.287 U	0.143 U	0.267 U	0.112 U	0.081 U	0.507 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	ng/kg	--	--	14.1	8.78	5.51	10.6	9.36	2.11 J	7.31	3.79	43.6
1,2,3,4,6,7,8-Heptachlorodibenzofuran	ng/kg	--	--	2.76 J	2.14 U	1.03 U	2.18 J	1.96 U	0.322 U	1.05 U	0.442 U	6.44
1,2,3,4,7,8,9-Heptachlorodibenzofuran	ng/kg	--	--	0.217 J	0.195 J	0.14 U	0.236 J	0.116 J	0.109 U	0.134 U	0.0954 U	0.662 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	ng/kg	--	--	0.144 U	0.134 U	0.0992 U	0.239 J	0.106 U	0.128 U	0.0868 U	0.0511 U	0.294 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	ng/kg	--	--	0.779 J	0.658 J	0.32 J	0.56 J	0.414 J	0.141 U	0.383 J	0.202 J	1.5 J
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	ng/kg	--	--	0.307 U	0.337 J	0.142 U	0.326 J	0.293 U	0.187 U	0.217 U	0.241 U	0.854 J
1,2,3,4,7,8-Hexachlorodibenzofuran	ng/kg	0.4	--	0.145 U	0.392 U	0.0777 U	0.338 U	0.244 U	0.155 U	0.253 U	0.0633 U	0.56 U
1,2,3,6,7,8-Hexachlorodibenzofuran	ng/kg	--	--	0.144 U	0.285 U	0.0744 U	0.29 U	0.143 U	0.148 U	0.126 U	0.0609 U	0.625 U
1,2,3,7,8,9-Hexachlorodibenzofuran	ng/kg	--	--	0.175 U	0.129 U	0.0871 U	0.185 U	0.0916 U	0.156 U	0.077 U	0.0693 U	0.244 U
2,3,4,6,7,8-Hexachlorodibenzofuran	ng/kg	--	--	0.159 U	0.261 U	0.0812 U	0.218 U	0.145 U	0.155 U	0.0717 U	0.0651 U	0.398 U
Octachlorodibenzo-p-dioxin	ng/kg	--	--	148	83.8	60.3	104	94.2	24.5	57.6	41.6	662
Octachlorodibenzofuran	ng/kg	--	--	11	6.46 J	4.96 J	7.32	6.45 J	0.886 J	3.44 J	1.58 J	26.5
GSI Total PCDD/F (U=1/2)	ng/kg	--	--	178 JT	103 JT	72.3 JT	127 JT	112 JT	29.3 JT	70.1 JT	48.0 JT	744 JT
GSI Total Dioxin/Furan TEQ-Mammalian (U=1/2)	ng/kg	--	--	0.717 JT	0.701 JT	0.322 JT	0.591 JT	0.423 JT	0.647 JT	0.385 JT	0.264 JT	1.85 JT

Table 5. Analytical Results for Surface Sediment

				URSC Composite Sample Results								
Analyte	Unit	Portland Harbor Cleanup Level [1]	Portland Harbor Nearshore RAL [2]	RM18.35E	RM18.45E	RM20.0E	RM20.0W	RM20.1W	RM20.4E	RM20.9W	RM24.7E	RM25.2E
Petroleum												
Diesel Range Hydrocarbons	mg/kg	91	--	7.7 U	15 U	4.8 U	13 U	12 U	3.7 U	5.6 U	4.2 U	18 U
Residual Range Hydrocarbons	mg/kg	--	--	49 U	80 U	22 U	60 U	69 U	15 U	38 U	15 U	120 U
Pesticides												
2,4'-DDD	ug/kg	--	--	0.074	0.063 U	0.063 U	0.063 U	0.063 U	0.063 U	0.063 U	0.063 U	0.063 U
2,4'-DDE	ug/kg	--	--	0.079 U	0.079 U	0.079 U	0.079 U	0.079 U	0.079 U	0.079 U	0.079 U	0.079 U
2,4'-DDT	ug/kg	--	--	0.1	0.094 U	0.094 U	0.094 U	0.094 U	0.094 U	0.094 U	0.094 U	0.094 U
4,4'-DDD	ug/kg	--	--	0.35	0.19	0.074	0.12	0.19	0.06 J	0.1	0.061 J	0.21
4,4'-DDE	ug/kg	--	--	0.72	0.36	0.15	0.21	0.38	0.075	0.19	0.1	0.34
4,4'-DDT	ug/kg	--	--	1.6	0.11	0.062 J	0.071	0.15	0.056 J	0.068 J	0.074	0.15
GSI Total 2,4-DDx (U=1/2)	ug/kg	--	--	0.21 T	0.094 UT	0.094 UT	0.094 UT	0.094 UT	0.094 UT	0.094 UT	0.094 UT	0.094 UT
GSI Total 4,4-DDx (U=1/2)	ug/kg	--	--	2.7 T	0.66 T	0.29 JT	0.40 T	0.72 T	0.19 JT	0.36 JT	0.24 JT	0.70 T
GSI Total DDD (U=1/2)	ug/kg	114	--	0.42 T	0.22 T	0.11 T	0.15 T	0.22 T	0.092 JT	0.13 T	0.092 JT	0.24 T
GSI Total DDE (U=1/2)	ug/kg	226	--	0.76 T	0.40 T	0.19 T	0.25 T	0.42 T	0.11 T	0.23 T	0.14 T	0.38 T
GSI Total DDT (U=1/2)	ug/kg	246	--	1.7 T	0.16 T	0.11 JT	0.12 T	0.20 T	0.10 JT	0.12 JT	0.12 T	0.20 T
GSI Total DDx (U=1/2)	ug/kg	6.1	160	2.9 T	0.78 T	0.40 JT	0.52 T	0.84 T	0.31 JT	0.48 JT	0.35 JT	0.82 T
alpha-Chlordane	ug/kg	--	--	0.0930 J	0.062 U	0.062 U	0.1 J	0.062 U	0.062 U	0.062 U	0.062 U	0.062 U
cis-Nonachlor	ug/kg	--	--	0.0970 U	0.097 U	0.097 U	0.097 U	0.097 U	0.097 U	0.097 U	0.097 U	0.097 U
gamma-Chlordane	ug/kg	--	--	0.1200 J	0.064 U	0.064 U	0.11 J	0.064 U	0.064 U	0.064 U	0.064 U	0.064 U
trans-Nonachlor	ug/kg	--	--	0.1100 J	0.058 U	0.058 U	0.1 J	0.058 U	0.058 U	0.058 U	0.058 U	0.06 J
Oxychlordane	ug/kg	--	--	0.1300 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
GSI Total Chlordane (U=1/2)	ug/kg	1.4	--	0.44 JT	0.13 UT	0.13 UT	0.42 JT	0.13 UT	0.13 UT	0.13 UT	0.13 UT	0.24 JT
alpha-Endosulfan	ug/kg	--	--	0.088 U	0.088 U	0.088 U	0.088 U	0.088 U	0.088 U	0.088 U	0.088 U	0.088 U
beta-Endosulfan	ug/kg	--	--	0.56	0.15 U	0.15 U	0.56	1.4 J	0.15 U	0.15 U	0.15 U	0.39
Endosulfan sulfate	ug/kg	--	--	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U
GSI Total Endosulfan (U=1/2)	ug/kg	--	--	0.63 T	0.15 UT	0.15 UT	0.63 T	1.5 JT	0.15 UT	0.15 UT	0.15 UT	0.46 T
Aldrin	ug/kg	2	--	0.079 U	0.079 U	0.079 U	0.079 U	0.079 U	0.079 U	0.079 U	0.079 U	0.079 U
alpha-Hexachlorocyclohexane	ug/kg	--	--	0.041 U	0.041 U	0.041 U	0.041 U	0.041 U	0.041 U	0.041 U	0.041 U	0.041 U
beta-Hexachlorocyclohexane	ug/kg	--	--	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U	0.061 U
Chlorpyrifos	ug/kg	--	--	0.45	0.37	0.077 U	0.12	0.35	0.077 U	0.18	0.077 U	0.44
delta-Hexachlorocyclohexane	ug/kg	--	--	0.097 U	0.097 U	0.097 U	0.097 U	0.097 U	0.097 U	0.097 U	0.097 U	0.097 U
Dieldrin	ug/kg	0.07	--	0.21	0.077 U	0.12 J	0.077 U	0.077 U	0.077 U	0.077 U	0.077 U	0.077 U
Endrin	ug/kg	--	--	0.073 U	0.073 U	0.073 U	0.073 U	0.073 U	0.073 U	0.073 U	0.073 U	0.073 U
Endrin aldehyde	ug/kg	--	--	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Endrin ketone	ug/kg	--	--	0.071 U	0.071 U	0.071 U	0.071 U	0.071 U	0.071 U	0.071 U	0.071 U	0.071 U
gamma-Hexachlorocyclohexane	ug/kg	5	--	0.035 J	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U
Heptachlor	ug/kg	--	--	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U
Heptachlor epoxide	ug/kg	--	--	0.073 U	0.073 U	0.073 U	0.073 U	0.073 U	0.073 U	0.073 U	0.073 U	0.073 U
Isodrin	ug/kg	--	--	0.069 U	0.069 U	0.069 U	0.069 U	0.069 U	0.069 U	0.069 U	0.069 U	0.069 U
Methoxychlor	ug/kg	--	--	0.073	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U
Mirex	ug/kg	--	--	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U
SVOCs/Pesticides												
Hexachlorobenzene	ug/kg	--	--	3.3 U	3.3 U	0.092 U	3.3 U	0.092 U	0.092 U	0.092 U	3.3 U	0.092 U
Phthalates												
Bis(2-ethylhexyl) phthalate	ug/kg	135	--	46 U	63 U	38 U	53 U	61 U	36 U	44 U	34 U	100 U
Phenols												
Pentachlorophenol	ug/kg	--	--	5.3 UJ	5.3 UJ	5.3 UJ	5.3 UJ	5.3 UJ	5.3 UJ	5.3 UJ	5.3 UJ	5.3 UJ

Table 5. Analytical Results for Surface Sediment

				URSC Composite Sample Results								
Analyte	Unit	Portland Harbor Cleanup Level [1]	Portland Harbor Nearshore RAL [2]	RM18.35E	RM18.45E	RM20.0E	RM20.0W	RM20.1W	RM20.4E	RM20.9W	RM24.7E	RM25.2E
Polycyclic Aromatic Hydrocarbons (PAHs)												
2-Methylnaphthalene	ug/kg	--	--	2.8 U	2.8 U	2.8 U	2.8 U	2.8 U	2.8 U	2.8 U	2.8 U	3.6 J
Acenaphthene	ug/kg	--	--	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U
Acenaphthylene	ug/kg	--	--	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U
Anthracene	ug/kg	--	--	3.2 U	3.2 U	15	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U
Benz(a)anthracene	ug/kg	--	--	9.7	15	180	16	5.7 J	3.6 U	3.6 U	3.6 U	4.6 J
Benzo(a)pyrene	ug/kg	--	--	18	18	130	29	13	4.8 J	7.4	8.3	10
Benzo(b)fluoranthene	ug/kg	--	--	15	17	190	28	11	3.4 U	3.7 J	4.8 J	7.9
Benzo(g,h,i)perylene	ug/kg	--	--	17	13	77 J	32	9.4 J	3.7 UJ	3.9 J	6.2 J	9.5 J
Benzo(k)fluoranthene	ug/kg	--	--	5.1 J	6.7 J	65	9.2	4 U	4 U	4 U	4 U	4 U
Chrysene	ug/kg	--	--	13	17	180	25	8.6	4.1 U	4.1 U	4.1 U	6.9 J
Dibenz(a,h)anthracene	ug/kg	--	--	3 U	3 U	20	4.3 J	3 U	3 U	3 U	3 U	3 U
Fluoranthene	ug/kg	--	--	25	18	270	37	16	3.7 U	5.4 J	3.7 U	12
Fluorene	ug/kg	--	--	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U
Indeno(1,2,3-cd)pyrene	ug/kg	--	--	12	10	81	25	7.3 J	3.2 U	3.2 U	4.3 J	4.2 J
Naphthalene	ug/kg	--	--	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	3.1 J
Phenanthrene	ug/kg	--	--	10	6.5 J	40	14	8.3	3.6 U	3.6 U	3.6 U	8.1
Pyrene	ug/kg	--	--	24	16	200	39	14	3.7 U	5.3 J	3.7 U	12
GSI Total LPAH (U=1/2)	ug/kg	--	--	19 T	16 JT	62 T	23 T	17 T	3.6 UT	3.6 UT	3.6 UT	21 JT
GSI Total HPAH (U=1/2)	ug/kg	--	--	140 JT	130 JT	1,400 JT	240 JT	88 JT	21 JT	35 JT	35 JT	71 JT
GSI Total PAH (U=1/2)	ug/kg	23,000	13,000	160 JT	150 JT	1,500 JT	270 JT	110 JT	25 JT	38 JT	38 JT	92 JT
GSI Total cPAH (BaPEq) (U=1/2)	ug/kg	12 [4]	--	23 JT	24 JT	200 T	40 JT	17 JT	6.8 JT	9.6 JT	11 JT	13 JT
Polychlorinated Biphenyls (PCBs)												
PCB 1	ng/kg	--	--	9.72 U	6.32 U	10.2 U	6.47 U	5.84 U	4.66 U	5.24 U	43.2 U	6.71 U
PCB 2	ng/kg	--	--	11.2 U	6.12 U	10.8 U	6.03 U	5.62 U	4.26 U	5.87 U	26.1 U	7.15 U
PCB 3	ng/kg	--	--	12.7 U	7.71 U	11.5 U	7.29 U	6.98 U	5.05 U	6.55 U	12.4 U	7.59 U
PCB 4	ng/kg	--	--	13.6 U	8.35 U	24.9 U	10.4 U	7.97 U	7.27 U	10.9 U	30.7 U	9.93 U
PCB 5	ng/kg	--	--	3.14 U	2.9 U	3.62 U	2.2 U	2.61 U	1.86 U	3.52 U	4.77 U	3.49 U
PCB 6	ng/kg	--	--	3.12 U	2.89 U	3.6 U	2.2 U	2.61 U	1.85 U	3.49 U	4.74 U	3.47 U
PCB 7	ng/kg	--	--	2.94 U	2.63 U	3.39 U	2 U	2.37 U	1.68 U	3.29 U	4.47 U	3.27 U
PCB 8	ng/kg	--	--	2.99 U	7.77 J	3.44 U	2.07 U	2.45 U	1.74 U	3.34 U	4.54 U	10.6
PCB 9	ng/kg	--	--	3.23 U	2.85 U	3.72 U	2.17 U	2.57 U	1.82 U	3.61 U	4.9 U	3.59 U
PCB 10	ng/kg	--	--	7.01 U	4.47 U	9 U	5.24 U	4.42 U	3.3 U	5.68 U	15.3 U	5.11 U
PCB 11	ng/kg	--	--	42.9	20.5	15.8	11.4 J	12.9 J	1.9 U	3.64 U	44.6	12.3 J
PCBs 12 + 13	ng/kg	--	--	3.07 U	2.86 U	3.54 U	2.17 U	2.58 U	1.83 U	3.44 U	4.67 U	3.42 U
PCB 14	ng/kg	--	--	3.25 U	2.9 U	3.75 U	2.21 U	2.62 U	1.86 U	3.64 U	4.94 U	3.62 U
PCB 15	ng/kg	--	--	6.04	8.53	2.46 U	2.6 U	3.24 U	1.87 U	3.73 U	4.8 U	10.7
PCB 16	ng/kg	--	--	19.8 U	20.3 U	11.5 U	16.6 U	23.5 U	16.3 U	14.1 U	27 U	16.3 U
PCB 17	ng/kg	--	--	18 U	17.2 U	10.5 U	14.1 U	19.9 U	13.8 U	12.9 U	24.6 U	14.8 U
PCBs 18 + 30	ng/kg	--	--	15.5 U	17 J	9.04 U	12.2 U	17.2 U	11.9 U	11.1 U	21.2 U	12.8 U
PCB 19	ng/kg	--	--	23.9 U	22.6 U	12.2 U	22.9 U	26.2 U	15.3 U	19.3 U	26.5 U	21.4 U
PCBs 20 + 28	ng/kg	--	--	19.8 U	31.2	11.3 U	10.9 U	14.5 U	5.69 U	17.5 U	15.8 U	22.1 J
PCBs 21 + 33	ng/kg	--	--	17.3 U	16.5 U	9.86 U	10.7 U	14.1 U	5.57 U	15.4 U	13.9 U	13.8 U
PCB 22	ng/kg	--	--	19.3 U	16.9 U	11 U	11 U	14.5 U	5.71 U	17.1 U	15.4 U	15.3 U
PCB 23	ng/kg	--	--	17.5 U	16.7 U	9.95 U	10.8 U	14.3 U	5.63 U	15.5 U	14 U	13.9 U
PCB 24	ng/kg	--	--	12 U	12.7 U	6.95 U	10.4 U	14.7 U	10.2 U	8.52 U	16.3 U	9.82 U
PCB 25	ng/kg	--	--	15.2 U	14.8 U	8.65 U	9.57 U	12.7 U	5 U	13.5 U	12.2 U	12.1 U

Table 5. Analytical Results for Surface Sediment

Analyte	Unit	Portland Harbor Cleanup Level [1]	Portland Harbor Nearshore RAL [2]	URSC Composite Sample Results								
				RM18.35E	RM18.45E	RM20.0E	RM20.0W	RM20.1W	RM20.4E	RM20.9W	RM24.7E	RM25.2E
PCBs 26 + 29	ng/kg	--	--	18.5 U	17.1 U	10.6 U	11.1 U	14.7 U	5.78 U	16.4 U	14.8 U	14.7 U
PCB 27	ng/kg	--	--	15.3 U	14 U	8.91 U	11.4 U	16.1 U	11.2 U	11 U	20.9 U	12.6 U
PCB 31	ng/kg	--	--	18.5 U	26.6	10.6 U	11.5 U	15.1 U	5.95 U	16.4 U	14.8 U	19.5 J
PCB 32	ng/kg	--	--	12.8 U	12.9 U	7.45 U	10.5 U	14.9 U	10.4 U	9.13 U	17.5 U	10.6 U
PCB 34	ng/kg	--	--	20.4 U	18.5 U	11.6 U	12.1 U	15.9 U	6.27 U	18.1 U	16.3 U	16.2 U
PCB 35	ng/kg	--	--	22 U	20.6 U	12.6 U	13.4 U	17.7 U	6.96 U	19.5 U	17.6 U	17.4 U
PCB 36	ng/kg	--	--	18.5 U	16.9 U	10.6 U	11 U	14.5 U	5.7 U	16.4 U	14.8 U	14.7 U
PCB 37	ng/kg	--	--	21.2 U	22.9 U	13.3 U	12.9 U	19.6 U	8.58 U	17.6 U	19.7 U	16.1 U
PCB 38	ng/kg	--	--	20.9 U	19.1 U	12 U	12.4 U	16.4 U	6.46 U	18.6 U	16.8 U	16.6 U
PCB 39	ng/kg	--	--	17.1 U	16.1 U	9.72 U	10.5 U	13.8 U	5.44 U	15.2 U	13.7 U	13.6 U
PCBs 41 + 71 + 40	ng/kg	--	--	16.1 U	11.7 U	8.18 U	11.7 J	13.8 U	5.57 U	12.7 U	20.6 U	24.4
PCB 42	ng/kg	--	--	17.1 UJ	11.8 UJ	8.71 UJ	11.7 UJ	13.9 UJ	5.61 UJ	13.5 UJ	22 UJ	13.2 UJ
PCBs 43 + 73	ng/kg	--	--	11.4 U	9.4 U	5.78 U	9.34 U	11.1 U	4.5 U	8.95 U	14.6 U	8.69 U
PCBs 44 + 47 + 65	ng/kg	--	--	33.3	37.4	19.6	37.5	16.4	4.61 U	9.87 U	16.1 U	56
PCBs 45 + 51	ng/kg	--	--	13.8 U	11.1 U	7.01 U	11 U	13.1 U	5.28 U	10.9 U	17.7 U	10.6 U
PCB 46	ng/kg	--	--	16.1 U	12.5 U	8.2 U	12.4 U	14.7 U	5.96 U	12.8 U	20.7 U	12.4 U
PCB 48	ng/kg	--	--	14.3 U	10.5 U	7.29 U	10.4 U	12.4 U	5 U	11.3 U	18.4 U	11 U
PCBs 49 + 69	ng/kg	--	--	19.5	18.5 J	11.5 J	33.4	11 U	4.46 U	9.4 U	15.3 U	35.2
PCBs 50 + 53	ng/kg	--	--	13.2 U	11 U	6.72 U	10.9 U	12.9 U	5.22 U	10.4 U	16.9 U	10.2 U
PCB 52	ng/kg	--	--	85.9	50.1 J	34	53.9	20.3	5.43 U	12.8 U	20.8 U	93.8
PCB 54	ng/kg	--	--	20.2 U	15.7 U	10.1 U	15.7 U	12 U	5.44 U	15.5 U	17.2 U	13.9 U
PCB 55	ng/kg	--	--	10.2 U	8.72 U	5.19 U	8.66 U	10.3 U	4.17 U	8.03 U	13.1 U	7.8 U
PCB 56	ng/kg	--	--	16.8 U	11.4 J	10.7 U	15.8	7.48 U	3.68 U	9.76 U	14 U	27.3
PCB 57	ng/kg	--	--	12.3 UJ	9.03 UJ	6.24 UJ	8.97 UJ	10.7 UJ	4.32 UJ	9.66 UJ	15.7 UJ	9.39 UJ
PCB 58	ng/kg	--	--	10.9 UJ	8.16 UJ	5.53 UJ	8.1 UJ	9.62 UJ	3.9 UJ	8.57 UJ	14 UJ	8.32 UJ
PCBs 59 + 62 + 75	ng/kg	--	--	10.9 U	8.29 U	5.54 U	8.23 U	9.77 U	3.96 U	8.59 U	14 U	8.34 U
PCB 60	ng/kg	--	--	15.6 U	6.55 U	9.92 U	6.02 U	7.21 U	3.54 U	9.08 U	13 U	11.2 U
PCB 63	ng/kg	--	--	11 UJ	8.73 UJ	5.57 UJ	8.67 UJ	10.3 UJ	4.17 UJ	8.62 UJ	14.1 UJ	8.38 UJ
PCB 64	ng/kg	--	--	13 J	16.7 J	6.05 UJ	17.9 J	9.77 UJ	3.96 UJ	9.37 UJ	15.3 UJ	23.2 J
PCB 66	ng/kg	--	--	36.4	25.3	20.9	57.2	10.5 U	4.22 U	8.86 U	14.4 U	75.3
PCB 67	ng/kg	--	--	8.79 UJ	7.36 UJ	4.49 UJ	7.31 UJ	8.68 UJ	3.52 UJ	6.95 UJ	11.3 UJ	6.75 UJ
PCB 68	ng/kg	--	--	10.4 UJ	8 UJ	5.27 UJ	7.94 UJ	9.43 UJ	3.82 UJ	8.16 UJ	13.3 UJ	7.92 UJ
PCBs 70 + 61 + 74 + 76	ng/kg	--	--	67.5	47.9	37.7	67.5	17.5 J	3.92 U	7.7 U	12.6 U	126
PCB 72	ng/kg	--	--	12.5 UJ	8.84 UJ	6.34 UJ	8.78 UJ	10.5 UJ	4.23 UJ	9.83 UJ	16 UJ	9.55 UJ
PCB 77	ng/kg	--	--	22.7 U	10.1 U	13.7 U	8.99 U	11.6 U	6.16 U	12.9 U	14 U	15.2 U
PCB 78	ng/kg	--	--	17 U	7.45 U	10.8 U	6.85 U	8.19 U	4.03 U	9.87 U	14.1 U	12.1 U
PCB 79	ng/kg	--	--	15.7 U	6.52 U	9.97 U	5.99 U	7.17 U	3.53 U	9.13 U	13.1 U	11.2 U
PCB 80	ng/kg	--	--	14.1 U	5.94 U	8.94 U	5.46 U	6.54 U	3.22 U	8.19 U	11.7 U	10.1 U
PCB 81	ng/kg	--	--	20 U	9.73 U	13.3 U	8.86 U	10.9 U	5.51 U	11.4 U	33.5 U	14.1 U
PCB 82	ng/kg	--	--	22.2 U	13.2 U	14.9 U	8.83 U	19.4 U	7.91 U	12.7 U	25.1 U	13.2 U
PCBs 83 + 99	ng/kg	--	--	119	33.8	53.1 J	49.9	14.3 U	5.83 U	9.69 U	19.3 U	121
PCB 84	ng/kg	--	--	36.4	13.5 U	9.6 U	20.2 J	17 U	7.62 U	14 U	16.4 U	51
PCBs 85 + 116 + 117	ng/kg	--	--	41	8.19 U	9.15 U	26.9 J	12.1 U	4.93 U	7.8 U	15.5 U	36.2
PCBs 86 + 87 + 97 + 109 + 119 + 125	ng/kg	--	--	109	29.7 J	49.7	46.9	12.4 U	5.04 U	7.94 U	15.8 U	128
PCBs 88 + 91	ng/kg	--	--	35.6	12.3 U	8.54 U	15.8	15.5 U	6.95 U	12.4 U	14.6 U	27.9 J
PCB 89	ng/kg	--	--	17.2 U	13.8 U	9.97 U	9.79 U	17.4 U	7.82 U	14.5 U	17 U	12.1 U
PCBs 90 + 101 + 113	ng/kg	--	--	194	54.5	71.7	63.3	12.8 U	5.21 U	15.1 J	16.4 U	184

Table 5. Analytical Results for Surface Sediment

Analyte	Unit	Portland Harbor Cleanup Level [1]	Portland Harbor Nearshore RAL [2]	URSC Composite Sample Results RM18.35E	RM18.45E	RM20.0E	RM20.0W	RM20.1W	RM20.4E	RM20.9W	RM24.7E	RM25.2E
PCB 92	ng/kg	--	--	49.5	10.4 U	18.6	13.5	15.3 U	6.25 U	10.1 U	20 U	31.9 J
PCB 94	ng/kg	--	--	14.8 U	12.2 U	8.56 U	8.65 U	15.4 U	6.91 U	12.5 U	14.6 U	10.4 U
PCBs 95 + 93 + 100	ng/kg	--	--	151	39 J	38.5	53.6	14.5 U	6.52 U	11.7 U	13.7 U	118
PCB 96	ng/kg	--	--	11.6 U	9.18 U	6.72 U	6.52 U	11.6 U	5.2 U	9.75 U	11.5 U	8.12 U
PCBs 98 + 102	ng/kg	--	--	13.3 U	10.8 U	7.69 U	7.66 U	13.6 U	6.12 U	11.2 U	13.1 U	9.29 U
PCB 103	ng/kg	--	--	13.2 U	10.9 U	7.65 U	7.69 U	13.7 U	6.14 U	11.1 U	13.1 U	9.23 U
PCB 104	ng/kg	--	--	14.2 U	12.4 U	8.33 U	8.85 U	15.1 U	5.42 U	13.9 U	14.1 U	9.91 U
PCB 105	ng/kg	--	--	40.9 J	11.5 J	39.9 J	34.6	14.5 U	5.61 U	8.27 U	10.4 U	94
PCB 106	ng/kg	--	--	15.6 U	7.64 U	12.5 U	7.03 U	11 U	4.59 U	8.7 U	11.6 U	13.5 U
PCB 107	ng/kg	--	--	15.5 U	7.82 U	12.4 U	7.21 U	11.3 U	4.7 U	8.69 U	11.6 U	13.4 U
PCBs 108 + 124	ng/kg	--	--	14.8 U	7.39 U	11.9 U	6.81 U	10.7 U	4.44 U	8.29 U	11.1 U	12.8 U
PCBs 110 + 115	ng/kg	--	--	294	57.3	84.3 J	97.3	26.1	4.33 U	21.1	12.9 U	209
PCB 111	ng/kg	--	--	12 U	7.33 U	8 U	4.93 U	10.8 U	4.41 U	6.82 U	13.6 U	7.1 U
PCB 112	ng/kg	--	--	11.3 U	7.12 U	7.56 U	4.79 U	10.5 U	4.29 U	6.44 U	12.8 U	6.71 U
PCB 114	ng/kg	--	--	15.4 U	8.9 U	12.6 U	8.22 U	13 U	5.62 U	8.5 U	10.3 U	13.6 U
PCB 118	ng/kg	--	--	164	38.1 J	133	68.4	20.5	5.8 U	14.8	9.15 U	201
PCB 120	ng/kg	--	--	12.3 U	7.77 U	8.21 U	5.23 U	11.5 U	4.68 U	7 U	13.9 U	7.29 U
PCB 121	ng/kg	--	--	13.3 U	7.21 U	8.89 U	4.85 U	10.7 U	4.34 U	7.58 U	15.1 U	7.9 U
PCB 122	ng/kg	--	--	17.3 U	8.63 U	13.8 U	7.95 U	12.5 U	5.19 U	9.65 U	12.9 U	14.9 U
PCB 123	ng/kg	--	--	16.5 U	8.97 U	12.4 U	8.41 U	13.2 U	5.71 U	8.57 U	16.7 U	14.1 U
PCB 126	ng/kg	--	--	17.4 U	10.3 U	14.5 U	9.35 U	17.3 U	6.3 U	9.26 U	13.2 U	17.2 U
PCB 127	ng/kg	--	--	16.2 U	8.17 U	13 U	7.52 U	11.8 U	4.91 U	9.07 U	12.1 U	14 U
PCBs 128 + 166	ng/kg	--	--	65.8	8.39 J	50.5	5.62 U	9.65 U	4.5 U	3.62 U	10.4 U	37.2
PCBs 129 + 138 + 163	ng/kg	--	--	399	76.6	342	87.7	28.5 J	5.53 U	42.1	15.1 J	237
PCB 130	ng/kg	--	--	21.7 U	8.74 U	9.57 J	7.48 U	12.9 U	5.99 U	5.09 U	14.7 U	12.7 U
PCB 131	ng/kg	--	--	20.2 U	7.83 U	7.52 U	6.7 U	11.6 U	5.37 U	4.73 U	13.6 U	11.8 U
PCB 132	ng/kg	--	--	114	13	46.3	17 J	11.5 U	5.35 U	7.72 J	13.4 U	69
PCB 133	ng/kg	--	--	20.9 U	8.14 U	7.79 U	6.96 U	12 U	5.57 U	4.9 U	14.1 U	12.3 U
PCB 134	ng/kg	--	--	36.6 U	11.1 U	13.7 U	9.42 U	16.2 U	7.54 U	8.6 U	24.7 U	21.5 U
PCBs 135 + 151 + 154	ng/kg	--	--	72.1	17.9	65.1	19.6	9.18 U	4.66 U	9.29 J	10.5 U	54.8
PCB 136	ng/kg	--	--	32.2	5.92 U	16.9 J	5.34 U	7.78 U	3.95 U	4.98 U	9.34 U	18.2 J
PCB 137	ng/kg	--	--	16.9 U	7.23 U	8.67 J	6.19 U	10.7 U	4.95 U	3.97 U	11.4 U	9.89 U
PCBs 139 + 140	ng/kg	--	--	16.8 U	6.67 U	6.25 U	5.7 U	9.79 U	4.57 U	3.93 U	11.3 U	9.79 U
PCB 141	ng/kg	--	--	36 J	7.1 U	43.9	8.82 J	10.5 U	4.86 U	7.65	11.7 U	34.5
PCB 142	ng/kg	--	--	20.4 U	7.76 U	7.62 U	6.64 U	11.4 U	5.32 U	4.79 U	13.8 U	12 U
PCB 143	ng/kg	--	--	13.8 U	5.92 U	5.16 U	5.07 U	8.7 U	4.05 U	3.25 U	9.33 U	8.09 U
PCB 144	ng/kg	--	--	9.98 U	7.81 U	7.52 J	7.05 U	10.3 U	5.21 U	6.11 U	11.5 U	6.55 U
PCB 145	ng/kg	--	--	7.5 U	5.38 U	4.07 U	4.86 U	7.08 U	3.59 U	4.59 U	8.62 U	4.92 U
PCB 146	ng/kg	--	--	30.2	8.01 J	45.8	5.73 U	9.84 U	4.59 U	6.34 J	11.8 U	35
PCBs 147 + 149	ng/kg	--	--	170 J	37.2	141	32.3	17.9 J	4.49 U	22.9 J	11.8 U	129
PCB 148	ng/kg	--	--	10.4 U	7.7 U	5.62 U	6.94 U	10.2 U	5.13 U	6.34 U	11.9 U	6.8 U
PCB 150	ng/kg	--	--	7.04 U	5 U	3.82 U	4.52 U	6.58 U	3.34 U	4.31 U	8.08 U	4.62 U
PCB 152	ng/kg	--	--	8.39 U	6.21 U	4.55 U	5.6 U	8.17 U	4.14 U	5.13 U	9.64 U	5.51 U
PCBs 153 + 168	ng/kg	--	--	211	48.2	274	53.9	21.5	4.06 U	28.9	9.35 U	151
PCB 155	ng/kg	--	--	10.1 U	7.38 U	5.51 U	6.47 U	7.77 U	4.27 U	6.73 U	11.6 U	6.32 U
PCBs 156 + 157	ng/kg	--	--	25.4 J	9.02 U	27.1 J	7.7 J	11.1 U	5.95 U	7.65 U	11.6 U	26.2
PCB 158	ng/kg	--	--	25.7 J	5.06 U	19.1 J	4.33 U	7.43 U	3.47 U	2.82 U	8.09 U	17.5 J

Table 5. Analytical Results for Surface Sediment

Analyte	Unit	Portland Harbor Cleanup Level [1]	Portland Harbor Nearshore RAL [2]	URSC Composite Sample Results RM18.35E	RM18.45E	RM20.0E	RM20.0W	RM20.1W	RM20.4E	RM20.9W	RM24.7E	RM25.2E
PCB 159	ng/kg	--	--	11.3 U	6.29 U	9.15 U	4.42 U	7.36 U	4.24 U	6.54 U	9.21 U	8.04 U
PCB 160	ng/kg	--	--	8.96 U	4.08 U	3.35 U	3.49 U	5.99 U	2.79 U	2.11 U	6.05 U	5.25 U
PCB 161	ng/kg	--	--	12.7 U	5.74 U	4.74 U	4.92 U	8.44 U	3.93 U	2.98 U	8.56 U	7.42 U
PCB 162	ng/kg	--	--	9.97 U	5.61 U	8.13 U	3.94 U	6.56 U	3.78 U	5.81 U	8.19 U	7.14 U
PCB 164	ng/kg	--	--	20.9 J	5.67 U	12.1 J	4.85 U	8.33 U	3.88 U	2.98 U	8.55 U	11.5 J
PCB 165	ng/kg	--	--	13.8 U	5.77 U	5.15 U	4.93 U	8.47 U	3.95 U	3.24 U	9.31 U	8.07 U
PCB 167	ng/kg	--	--	17.1	5.58 U	12.9 J	4.25 U	7.48 U	4.15 U	5.93 U	7.88 U	7.23 U
PCB 169	ng/kg	--	--	11.6 U	6.89 U	9 U	4.8 U	8 U	4.97 U	6.1 U	8.58 U	7.87 U
PCB 170	ng/kg	--	--	40.3 J	16.1 J	127	16.1 J	12.4 U	6.88 U	9.18 U	14.8 U	27.2 J
PCBs 171 + 173	ng/kg	--	--	19.7 U	11.6 U	42.7	10.9 U	11.6 U	6.39 U	9.97 U	16 U	15.6 U
PCB 172	ng/kg	--	--	20.3 U	11.9 U	35.7	11.1 U	11.9 U	6.56 U	10.3 U	16.4 U	16 U
PCB 174	ng/kg	--	--	48.8	10.4 U	201	13.1 J	10.4 U	5.77 U	9.31 U	15 U	34.6 J
PCB 175	ng/kg	--	--	10.9 U	9.94 U	6.59 U	8 U	10.7 U	5.91 U	7.85 U	10.8 U	6.54 U
PCB 176	ng/kg	--	--	8.5 U	7.71 U	22.9	6.21 U	8.29 U	4.58 U	6.13 U	8.38 U	5.11 U
PCB 177	ng/kg	--	--	23.3	12 U	96.2	11.3 U	12 U	6.65 U	10.2 U	16.4 U	20.2 J
PCB 178	ng/kg	--	--	11.4 U	10.3 U	44.5	8.25 U	11.1 U	6.09 U	8.17 U	11.2 U	6.81 U
PCB 179	ng/kg	--	--	11 J	7.57 U	81.4	6.1 U	8.14 U	4.5 U	6.1 U	8.34 U	18.5 J
PCBs 180 + 193	ng/kg	--	--	81.3	30.1	433	35.7 J	15.2 J	4.93 U	7.37 U	11.9 U	64.8 J
PCB 181	ng/kg	--	--	17.4 U	10.2 U	8.77 U	9.57 U	10.2 U	5.66 U	8.81 U	14.2 U	13.8 U
PCB 182	ng/kg	--	--	9.7 U	8.93 U	5.87 U	7.19 U	9.6 U	5.31 U	6.99 U	9.56 U	5.82 U
PCBs 183 + 185	ng/kg	--	--	34.3	10.4 U	139	9.72 U	10.4 U	5.75 U	9.27 U	14.9 U	24.4 J
PCB 184	ng/kg	--	--	7.53 U	6.66 U	4.56 U	5.36 U	7.16 U	3.96 U	5.43 U	7.42 U	4.52 U
PCB 186	ng/kg	--	--	7.82 U	7.15 U	4.73 U	5.76 U	7.69 U	4.25 U	5.64 U	7.71 U	4.7 U
PCB 187	ng/kg	--	--	46.2	20.2 J	287	25.4	9.3 U	5.14 U	11.1 J	9.67 U	55.3
PCB 188	ng/kg	--	--	11.2 U	10.2 U	6.68 U	8.24 U	9.94 U	6.07 U	8.28 U	10.8 U	6.98 U
PCB 189	ng/kg	--	--	15.8 U	10.1 U	8.05 U	9.35 U	11.2 U	5.52 U	7.73 U	13.1 U	11.9 U
PCB 190	ng/kg	--	--	12.5 U	8.48 U	36.2 J	7.97 U	8.49 U	4.71 U	6.3 U	10.1 U	9.81 U
PCB 191	ng/kg	--	--	14.9 U	8.81 U	7.49 U	8.28 U	8.81 U	4.89 U	7.52 U	12.1 U	11.8 U
PCB 192	ng/kg	--	--	14.4 U	8.47 U	7.23 U	7.96 U	8.48 U	4.71 U	7.26 U	11.7 U	11.3 U
PCB 194	ng/kg	--	--	18.1 U	12.9 U	252	13.9	10.1 U	5.54 U	8.23 U	16.8 U	23.2
PCB 195	ng/kg	--	--	18.5 U	13.5 U	90.9	7.03 U	10.5 U	5.77 U	8.4 U	17.1 U	11.1 U
PCB 196	ng/kg	--	--	16.8 U	12.5 U	102	6.52 U	9.69 U	5.36 U	7.62 U	15.5 U	10 U
PCB 197	ng/kg	--	--	10.9 U	8.43 U	7.78 U	4.42 U	6.56 U	3.63 U	4.92 U	10.1 U	6.46 U
PCBs 198 + 199	ng/kg	--	--	16.1 J	12.1 J	252	16.3	9.34 U	5.16 U	6.66 U	13.6 U	29.4
PCB 200	ng/kg	--	--	12.1 U	9.25 U	37.4	4.85 U	7.21 U	3.99 U	5.47 U	11.2 U	7.18 U
PCB 201	ng/kg	--	--	12.2 U	9.24 U	8.74 U	4.84 U	7.2 U	3.98 U	5.53 U	11.3 U	7.26 U
PCB 202	ng/kg	--	--	13.2 U	10.6 U	57	5.78 U	8.29 U	4.64 U	6.19 U	14.1 U	8.05 U
PCB 203	ng/kg	--	--	13.2 U	10.7 U	159	9.15	8.27 U	4.57 U	5.98 U	12.2 U	7.84 U
PCB 204	ng/kg	--	--	12 U	9.05 U	8.6 U	4.74 U	7.05 U	3.9 U	5.44 U	11.1 U	7.14 U
PCB 205	ng/kg	--	--	15.1 U	11.3 U	10.4 U	5.62 U	8.64 U	4.72 U	6.59 U	12.1 U	8.77 U
PCB 206	ng/kg	--	--	13.4 U	15.8 U	105	12 U	17.5 U	7.52 U	13.4 U	20.7 U	18 U
PCB 207	ng/kg	--	--	11.5 U	7.36 U	8.04 U	9.51 U	10.5 U	5.51 U	4.77 U	11.1 U	9.31 U
PCB 208	ng/kg	--	--	11.7 U	6.9 U	21.4 J	9.92 U	9.89 U	5.19 U	4.94 U	11.4 U	9.18 U
PCB 209	ng/kg	--	--	12	12.3 J	13.8	6.46 J	16.3 J	5.5 U	7.89 U	9.14 U	12.1
GSI Total PCB Congeners (U=1/2)	ng/kg	9,000	75,000	3,920 JT	1,510 JT	4,850 JT	1,660 JT	1,040 JT	16 UJT	845 JT	1,170 JT	3,460 JT

Table 5. Analytical Results for Surface Sediment

Analyte	Unit	Portland Harbor Cleanup Level [1]	Portland Harbor Nearshore RAL [2]	URSC Composite Sample Results								
				RM18.35E	RM18.45E	RM20.0E	RM20.0W	RM20.1W	RM20.4E	RM20.9W	RM24.7E	RM25.2E
Polybrominated Diphenyl Ethers (PBDEs)												
PBDE 17	ug/kg	--	--	0.046 U	0.023 UJ	0.43	0.046 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U
PBDE 28	ug/kg	--	--	0.048 U	0.024 UJ	0.63	0.048 U	0.024 U	0.26	0.024 U	0.024 U	0.024 U
PBDE 47	ug/kg	--	--	1.1	0.25 J	3.7	0.81	0.29	1.4	0.17	0.029 U	0.029 U
PBDE 66	ug/kg	--	--	0.27	0.019 UJ	1.2	0.038 U	0.019 U	0.4	0.019 U	0.019 U	0.019 U
PBDE 71	ug/kg	--	--	0.29	0.015 UJ	0.059 J	0.03 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U
PBDE 85	ug/kg	--	--	0.08 U	0.04 UJ	0.3	0.08 U	0.04 U	0.14	0.04 U	0.04 U	0.04 U
PBDE 99	ug/kg	--	--	1.1	0.03 UJ	4	0.83	0.03 U	1.8	0.03 U	0.03 U	0.03 U
PBDE 100	ug/kg	--	--	0.028 U	0.014 UJ	0.31	0.028 U	0.014 U	0.23	0.014 U	0.014 U	0.014 U
PBDE 128	ug/kg	--	--	0.02 U	0.0099 UJ	0.17 J	0.02 U	0.0099 U	0.0099 U	0.0099 U	0.0099 U	0.0099 U
PBDE 138	ug/kg	--	--	0.032 U	0.016 U	0.15	0.032 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
PBDE 153	ug/kg	--	--	0.37	0.0087 UJ	0.97	0.018 U	0.0087 U	0.36	0.0087 U	0.0087 U	0.0087 U
PBDE 154	ug/kg	--	--	0.016 U	0.0078 UJ	0.26	0.016 U	0.0078 U	0.13	0.0078 U	0.0078 U	0.0078 U
PBDE 183	ug/kg	--	--	0.026 U	0.013 UJ	0.39	0.026 U	0.013 U	0.12	0.013 U	0.013 U	0.013 U
PBDE 190	ug/kg	--	--	0.04 U	0.02 UJ	0.02 U	0.04 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
PBDE 203	ug/kg	--	--	0.058 U	0.029 UJ	0.094	0.058 U	0.029 U	0.029 U	0.029 U	0.029 U	0.029 U
PBDE 206	ug/kg	--	--	1.7 J	0.031 UJ	3.1	2	0.031 U	1.1	0.031 U	0.031 U	0.031 U
PBDE 209	ug/kg	--	--	39	2.1 J	120 J	68	4.7 J	42 J	2.9 J	0.89 J	0.026 U

Notes:

Highlighted values indicate detected results that exceed the associated Portland Harbor cleanup level (CUL).

1 Sediment cleanup level / target specified in Table 17 of the Record of Decision (ROD) for the Portland Harbor Superfund Site (Portland Harbor). (ROD; EPA, 2017)

2 Nearshore Remedial Action Level (RAL) specified in Table 21 of the Record of Decision (ROD) for the Portland Harbor Superfund Site (Portland Harbor). (ROD; EPA, 2017)

3 Grainsize analysis was run on the homogenized sediment samples following sieving and removal of material > 2 mm (i.e., gravels).

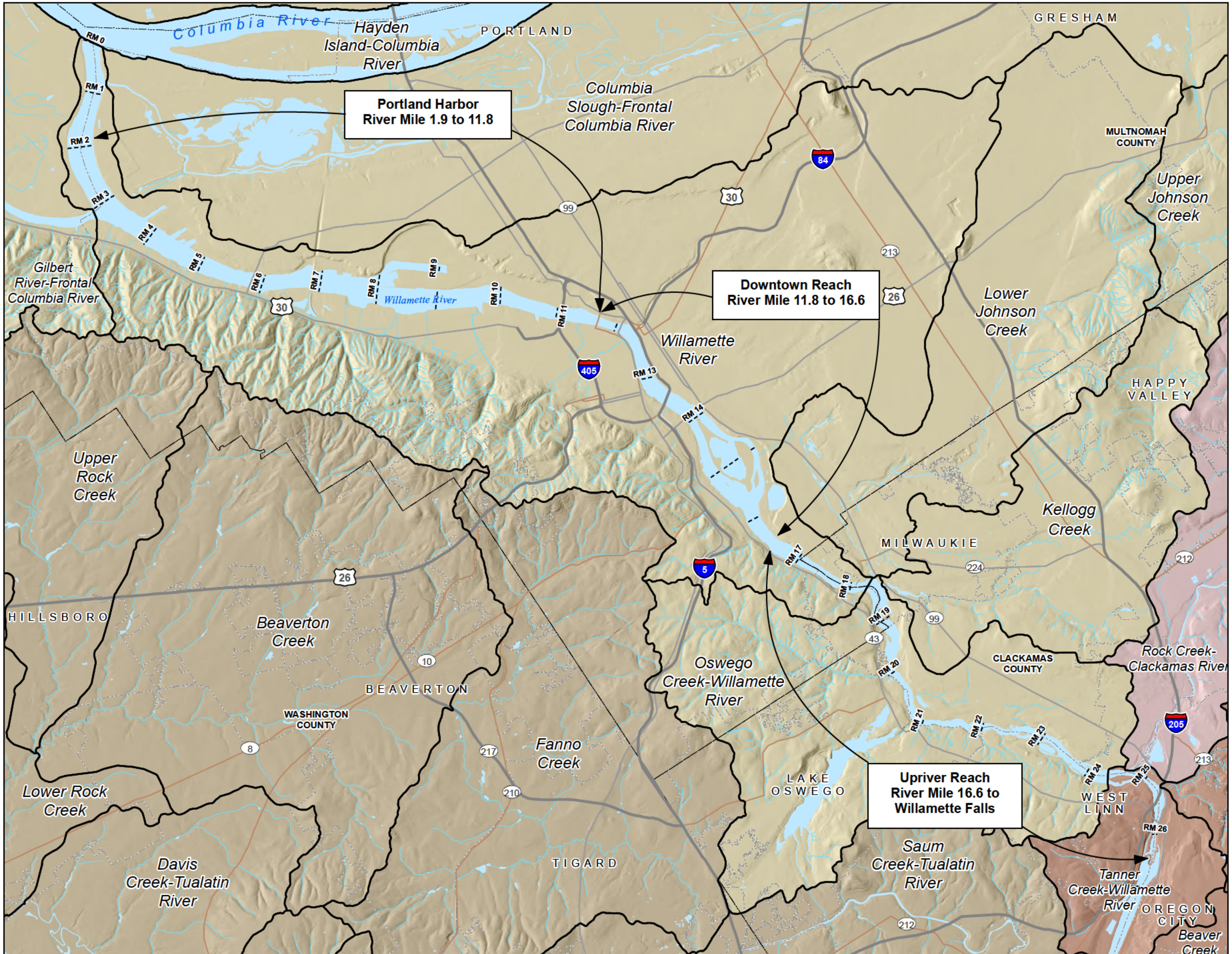
4 The cleanup level for cPAHs of 12 ug/kg is based on direct contact with sediment and is applicable to nearshore sediment. The toxicity of cPAHs has recently been updated in EPA's Integrated Risk Information System. Application of the updated toxicity information results in a risk-based level of 85 ug/kg.

"GSI Total" indicates analyte group calculations performed by GSI Water Solutions. Summations were performed in accordance with the rules specified in the Final Work Plan.

FIGURE 1

Upriver Reach Project Location

URSC Field and Data Report



LEGEND

Willamette Watershed Basin

8 Gigit Hydrologic Unit Code (HUC)

- Clackamas
- Lower Willamette
- Middle Willamette
- Tualatin
- Sub-Basin Unit - 12 Digit HUC

All Other Features

- County Line
- City Limit
- River Mile (RM)
- Watercourse
- Waterbody

N

0 0.75 1.5 2.25

Miles

Date: March 9, 2018

Data Sources: BES, METRO, COP

GSI Water Solutions, Inc.

Document Path: P:\Portland\205 - OR DEQ\026-Upriver Sediment Characterization\Project_GIS\Project_mxds\FDR\Figure1_UpriverReachProjectLocation.mxd

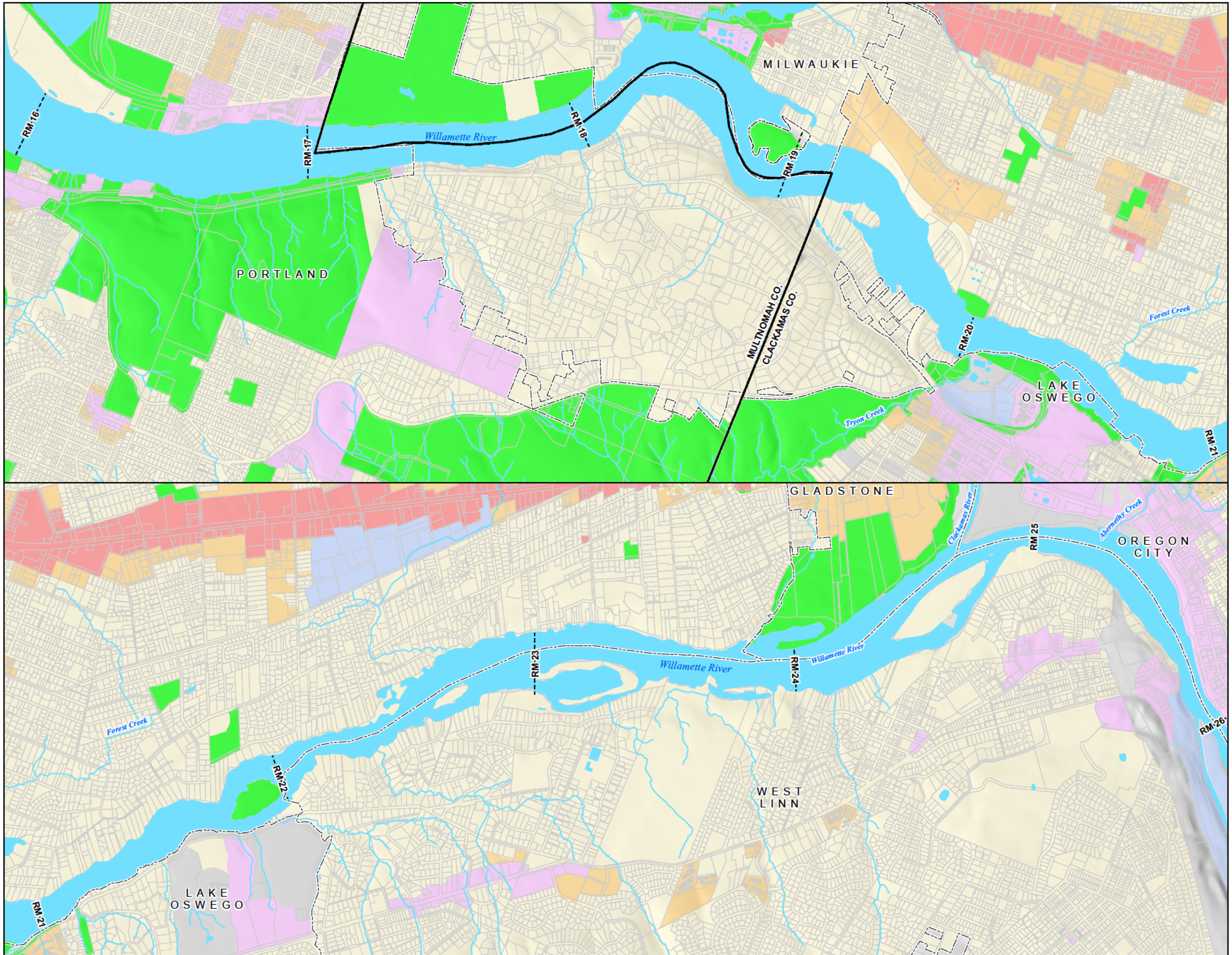


FIGURE 2

Land Use in the Upriver Reach
River Mile 16.6 to Willamette Falls
URSC Field and Data Report

LEGEND

Zoning
- Commercial
- Industrial
- Multi Family Residential
- Mixed Use Residential
- Public Facilities
- Parks and Open Spaces
- Single Family

All Other Features
- Tax Lot
- City Limit
- County Line
- River Mile (RM)
- Watercourse
- Waterbody

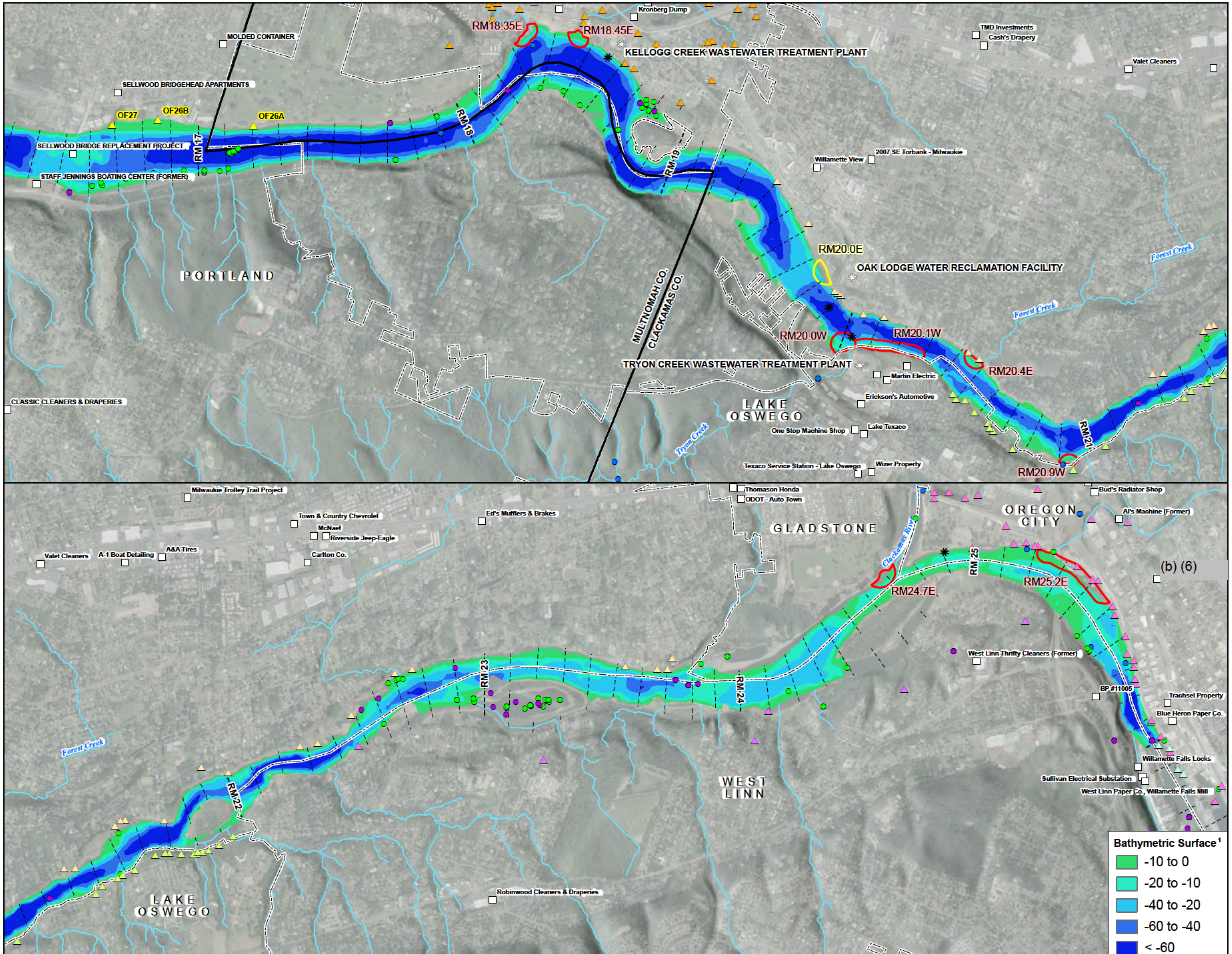
0 900 1,800 2,700
Feet

Date: March 9, 2018
Data Sources: BES, METRO, COP

GSI Water Solutions, Inc.

Document Path: P:\Portland\205 - OR DEQ\026-Upriver Sediment Characterization\Project_GIS\Project_mxds\FDR\Figure2_LandUse_UpriverReach.mxd

FIGURE 3
Upriver Reach Sediment Sampling Locations
URSC Field and Data Report



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LEGEND

- URSC Sample
- Added Sample

Outfalls

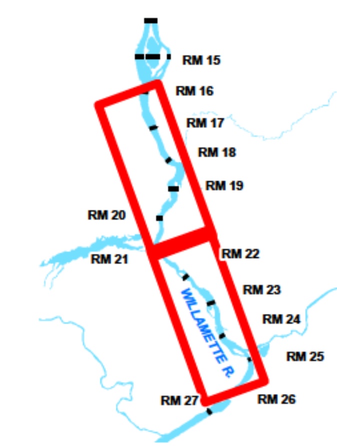
- Blue Heron Paper Mill Outfall
- City of Lake Oswego Outfall
- City of Milwaukie Outfall
- Ci y of Portland Outfall
- City of West Linn Outfall
- Oak Lodge Water Services Outfall
- Oregon City Outfall

Historical Sampling Location

- Surface Sediment
- Water
- Biological

All Other Features

- River Mile (RM)
- DEQ ECSI Site
- Wastewater Treatment Plant
- Wastewater Treatment Plant Discharge Point (approximate)
- City Limit
- County Line
- Watercourse
- Waterbody



0 900 1,800 2,700
Feet

Notes:
Location information for outfalls beyond what is depicted was not readily available.
URSC = Upriver Reach Sediment Characterization
1. Elevations in feet are relative to Columbia River Datum (CRD), U. S. Army Corps of Engineers, Hydrographic Surveys, 1999

Date: March 30, 2018
Data Sources: BES, METRO, COP

GSI Water Solutions, Inc.

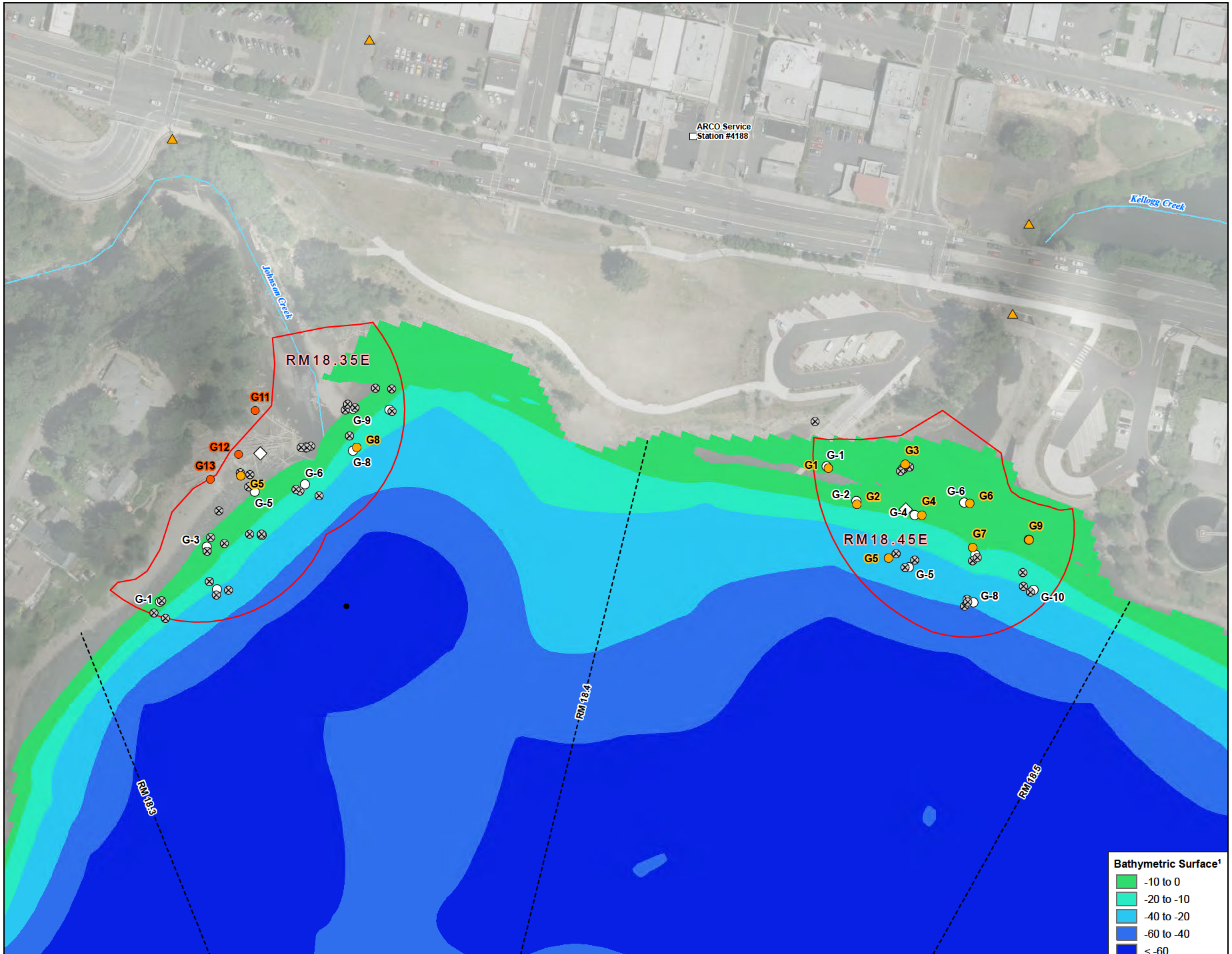


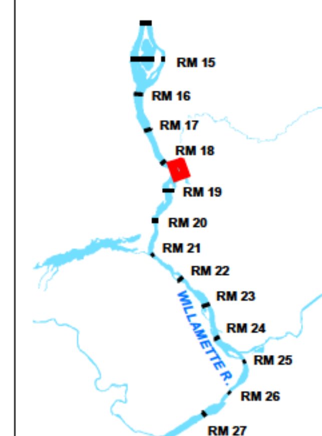
FIGURE 4
RM18.35E and 18.45E Sediment Sampling Locations
URSC Field and Data Report

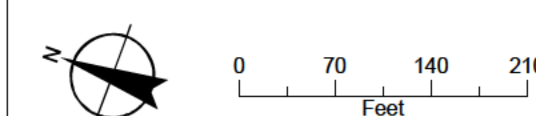
LEGEND

Sample Location
- Successful Manual Grab Sample
- Successful Power-Grab Sample
- Unsuccessful Power-Grab Sample
- Target Sample Location
- DEQ Composite Sample Centroid
- URSC Sample Area

Historical Sampling Location
- Surface Sediment
- Water
- Biological

All Other Features
- River Mile (RM)
- DEQ ECSI Site
- City of Milwaukie Outfall
- Wastewater Treatment Plant
- Wastewater Treatment Plant Discharge Point (approximate)
- City Limit
- Watercourse
- Waterbody





Notes:
G9 sample coordinates were not collected andarea approximated based on the target sample coordinates
Location information for outfalls beyond what is depicted was not readily available.
URSC = Upriver Reach Sediment Characterization
1. Elevations in feet are relative to Columbia River Datum (CRD), U. S. Army Corps of Engineers, Hydrographic Surveys, 1999

Date: May 7, 2018
Data Sources: BES, METRO, COP

GSI Water Solutions, Inc.

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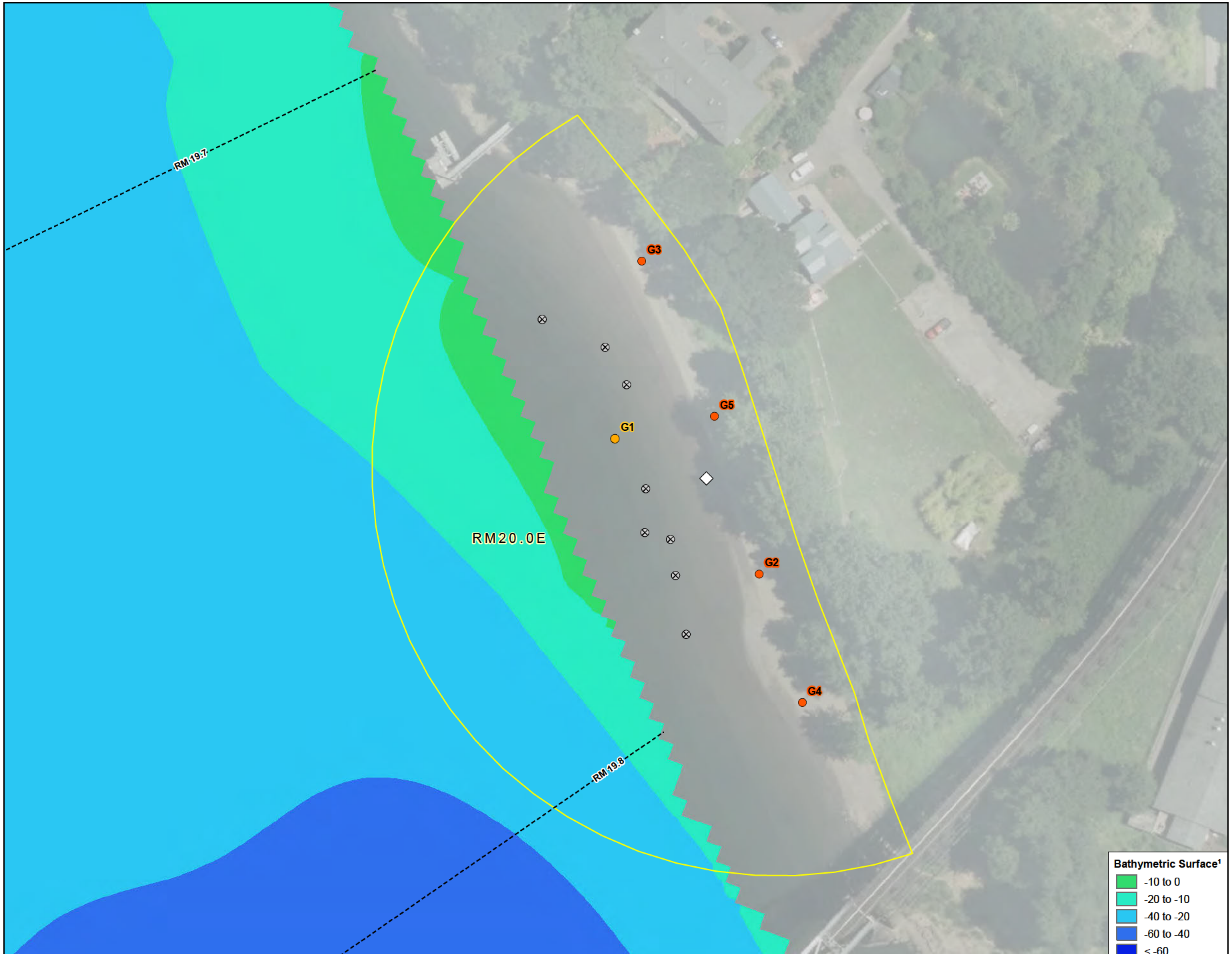
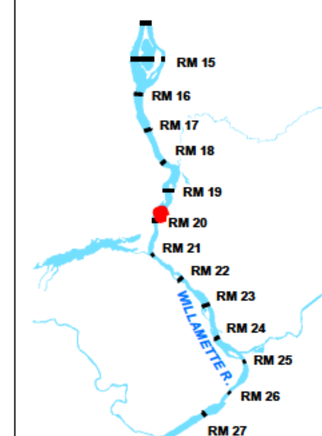


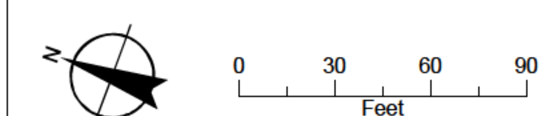
FIGURE 5
RM20.0E
Sediment Sampling Locations
URSC Field and Data Report

LEGEND
Sample Location
- Successful Manual Grab Sample
- Successful Power-Grab Sample
- Unsuccessful Power-Grab Sample
- Target Sample Location
- DEQ Composite Sample Centroid
- Added URSC Sample Area

Historical Sampling Location
- Surface Sediment
- Water
- Biological

All Other Features
- River Mile (RM)
- DEQ ECSI Site
- Oak Lodge Water Services Outfall
- Wastewater Treatment Plant
- Wastewater Treatment Plant Discharge Point (approximate)
- City Limit
- Watercourse
- Waterbody



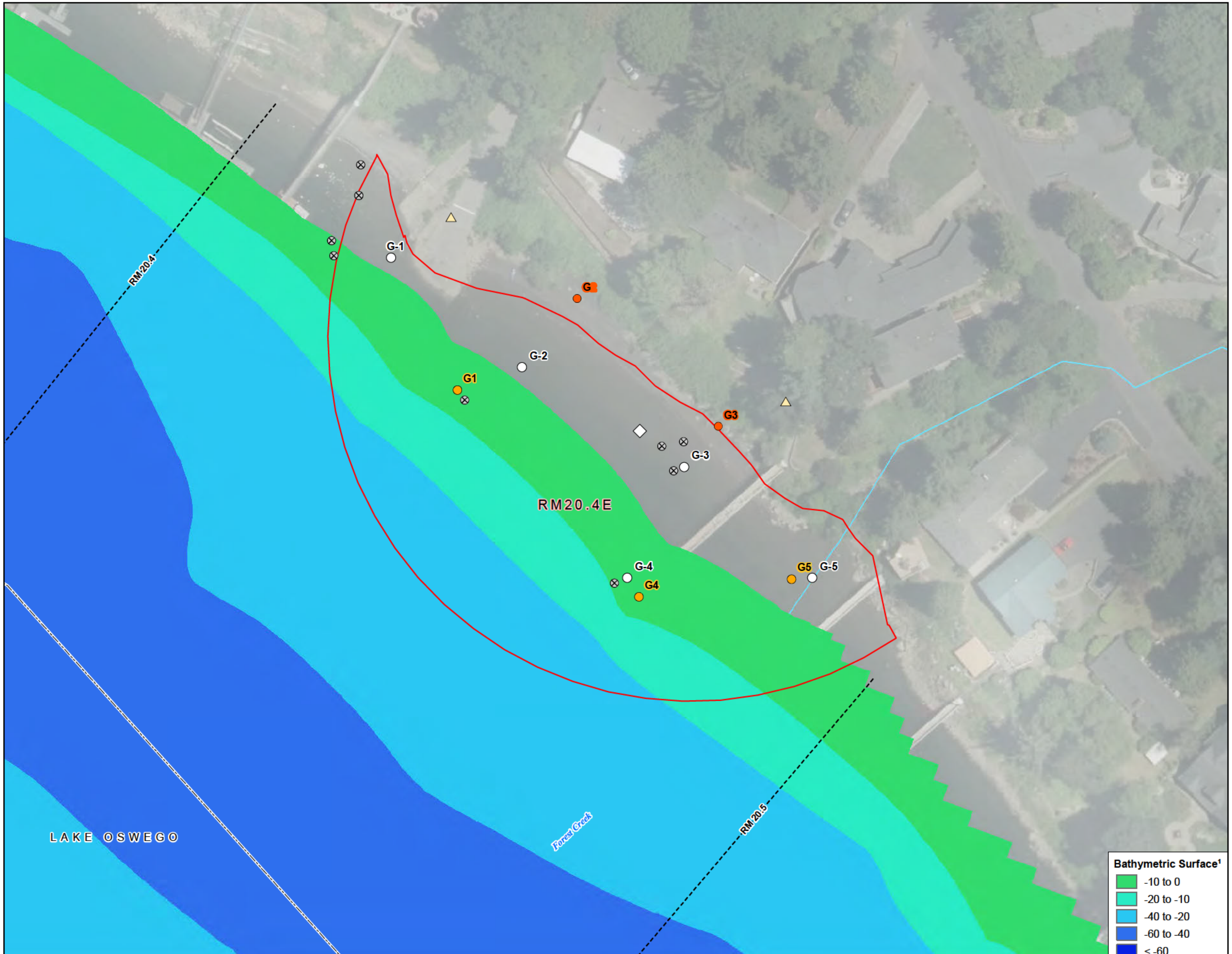


Notes:
Location information for outfalls beyond what is depicted was not readily available.
URSC = Upriver Reach Sediment Characterization
1. Elevations in feet are relative to Columbia River Datum (CRD), U. S. Army Corps of Engineers, Hydrographic Surveys, 1999

Date: May 7, 2018
Data Sources: BES, METRO, COP

GSI Water Solutions, Inc.

Document Path: P:\Portland\205 - OR DEQ\026-Upriver Sediment Characterization\Project_GIS\Project_mxds\FDR\Figure5_RM20_0E.mxd



Bathymetric Surface[1]

- -10 to 0
- -20 to -10
- -40 to -20
- -60 to -40
- < -60

FIGURE 6
RM20.4E
Sediment Sampling Locations
URSC Field and Data Report

LEGEND

Sample Location

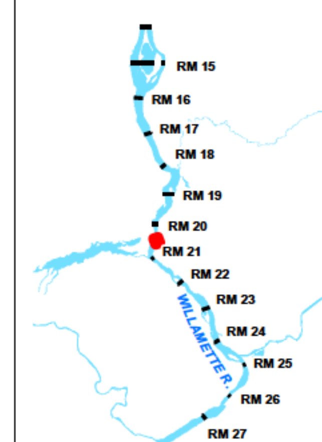
- Successful Manual Grab Sample
- Successful Power-Grab Sample
- Unsuccessful Power-Grab Sample
- Target Sample Location
- DEQ Composite Sample Centroid
- URSC Sample Area

Historical Sampling Location

- Surface Sediment
- Water
- Biological

All Other Features

- River Mile (RM)
- DEQ ECSI Site
- Oak Lodge Water Services Outfall
- Wastewater Treatment Plant
- Wastewater Treatment Plant Discharge Point (approximate)
- City Limit
- Watercourse
- Waterbody



N

0 30 60 90
Feet

Notes:
Location information for outfalls beyond what is depicted was not readily available.
URSC = Upriver Reach Sediment Characterization
1. Elevations in feet are relative to Columbia River Datum (CRD), U. S. Army Corps of Engineers, Hydrographic Surveys, 1999

Date: May 7, 2018
Data Sources: BES, METRO, COP

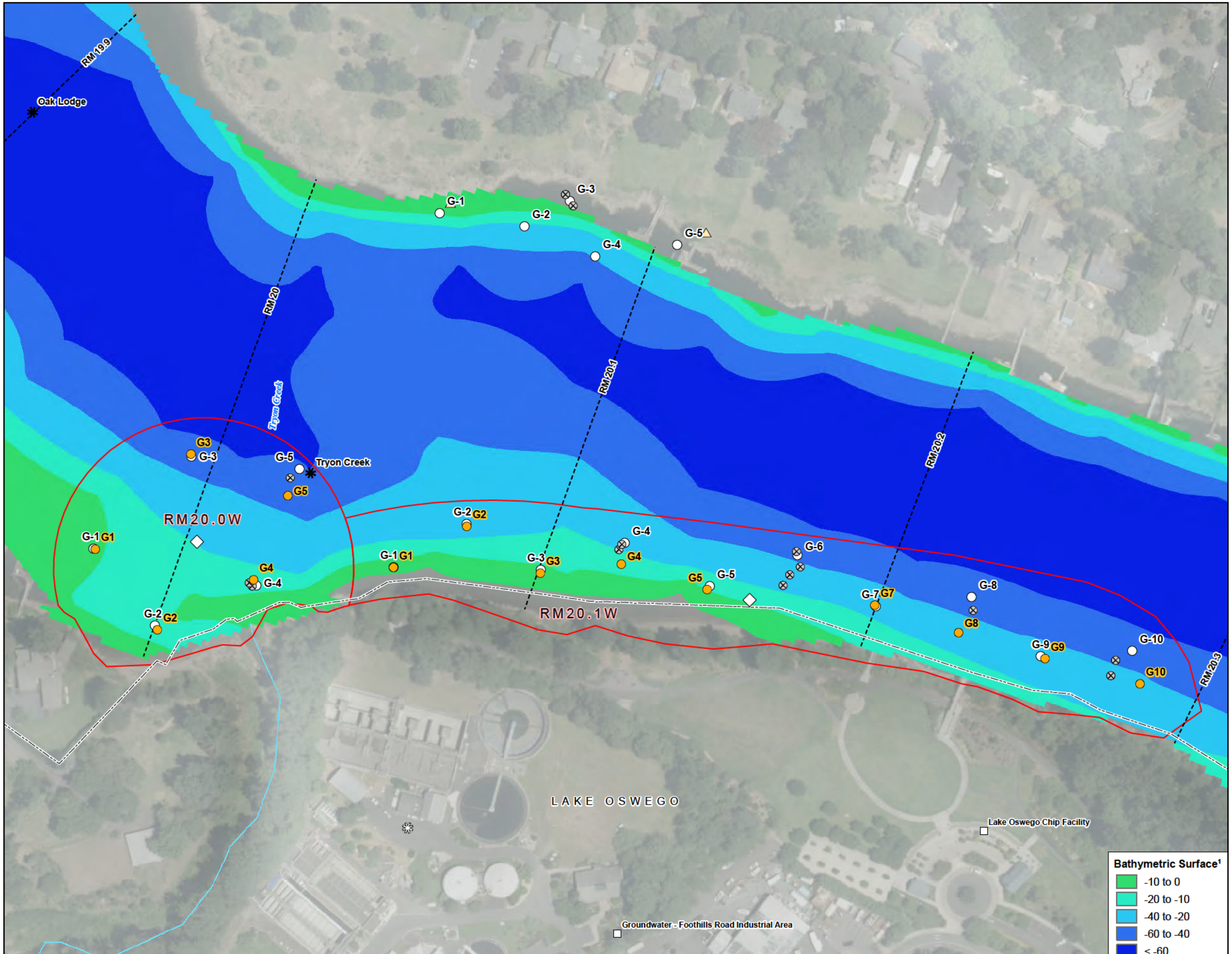
GSI Water Solutions, Inc.

Document Path: P:\Portland\205 - OR DEQ\026-Upriver Sediment Characterization\Project_GIS\Project_mxds\FDR\Figure6_RM20_4.mxd

FIGURE 7

RM20.0W, RM20.1W, and RM20.2E Sediment Sampling Locations

URSC Field and Data Report



LEGEND

Sample Location

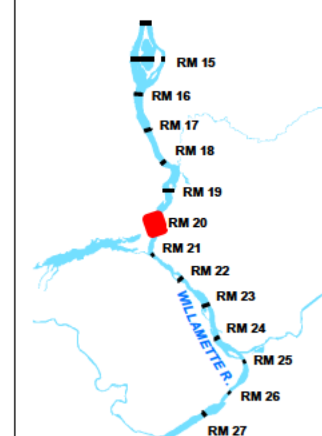
- Successful Power-Grab Sample
- Unsuccessful Power-Grab Sample
- Target Sample Location
- DEQ Composite Sample Centroid
- URSC Sample Area

Historical Sampling Location

- Surface Sediment
- Water
- Biological

All Other Features

- River Mile (RM)
- DEQ ECSI Site
- Oak Lodge Water Services Outfall
- Wastewater Treatment Plant
- Wastewater Treatment Plant Discharge Point (approximate)
- City Limit
- Watercourse
- Waterbody



N

0 75 150 225

Feet

Notes:
Location information for outfalls beyond what is depicted was not readily available.
URSC = Upriver Reach Sediment Characterization
1. Elevations in feet are relative to Columbia River Datum (CRD), U. S. Army Corps of Engineers, Hydrographic Surveys, 1999

Date: May 7, 2018
Data Sources: BES, METRO, COP

GSI Water Solutions, Inc.

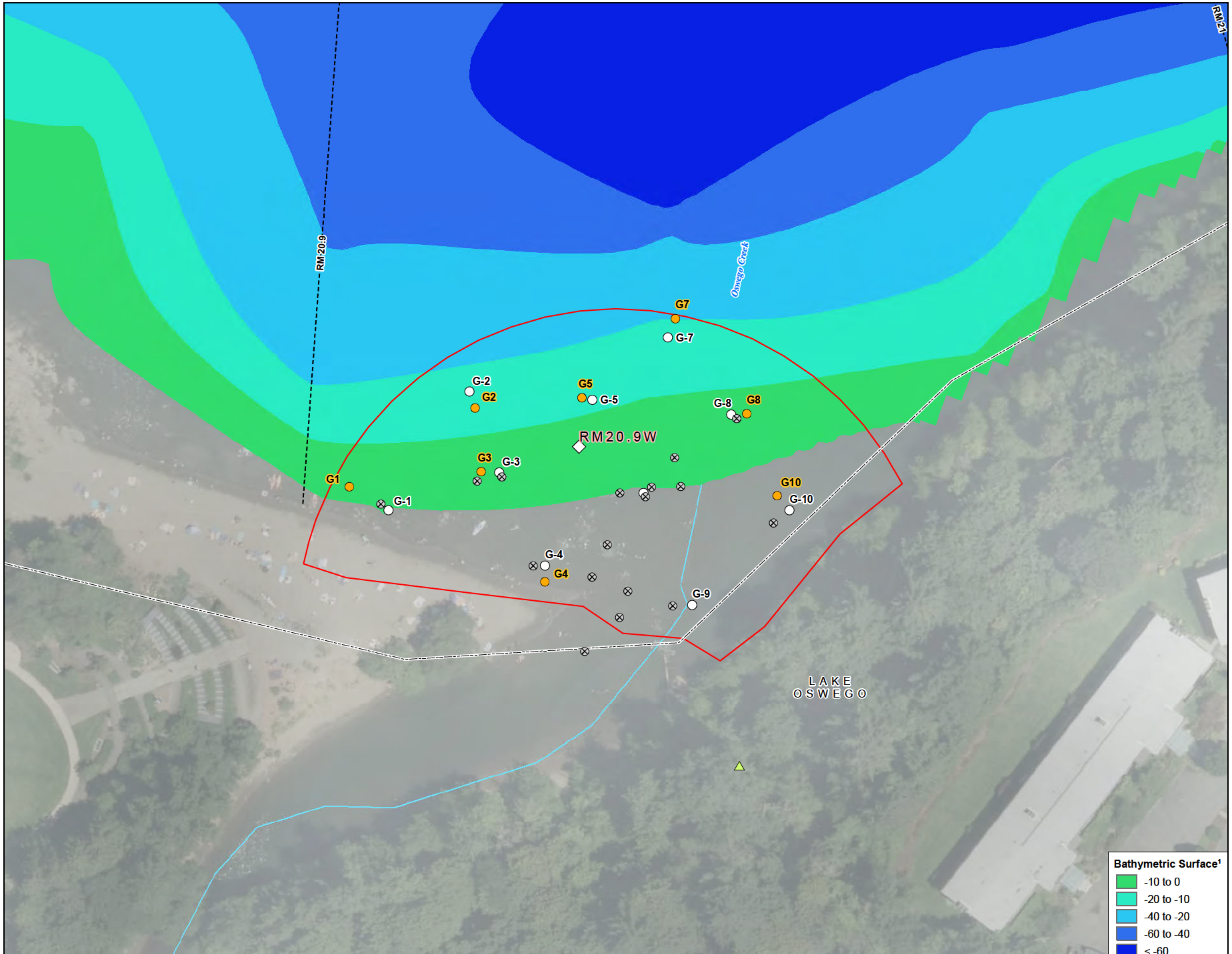


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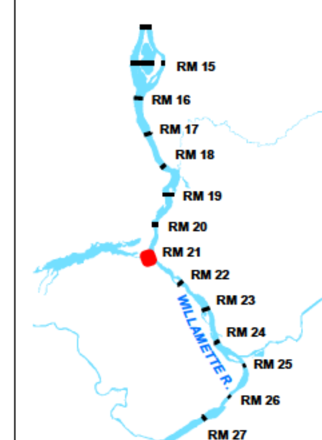
FIGURE 8
RM20.9W
Sediment Sampling Locations
URSC Field and Data Report

LEGEND

Sample Location
- Successful Power-Grab Sample
- Unsuccessful Power-Grab Sample
- Target Sample Location
- DEQ Composite Sample Centroid
- URSC Sample Area

Historical Sampling Location
- Surface Sediment
- Water
- Biological

All Other Features
- River Mile (RM)
- DEQ ECSI Site
- City of Lake Oswego Outfall
- Wastewater Treatment Plant
- Wastewater Treatment Plant Discharge Point (approximate)
- City Limit
- Watercourse
- Waterbody



0 30 60 90
Feet

Notes:
Location information for outfalls beyond what is depicted was not readily available.
URSC = Upriver Reach Sediment Characterization
1. Elevations in feet are relative to Columbia River Datum (CRD), U. S. Army Corps of Engineers, Hydrographic Surveys, 1999

Date: May 7, 2018
Data Sources: BES, METRO, COP

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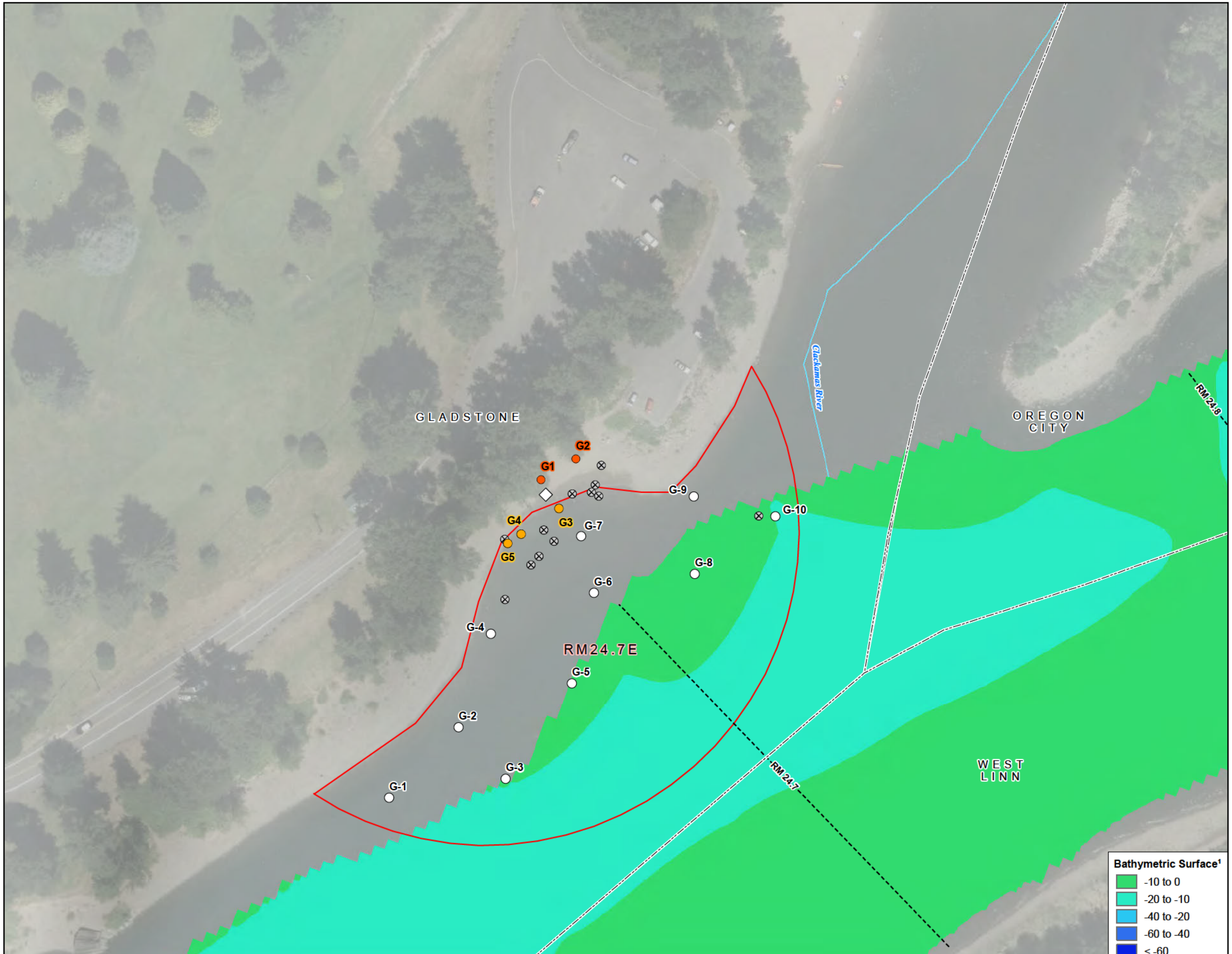
FIGURE 9
RM24.7E
Sediment Sampling Locations
URSC Field and Data Report

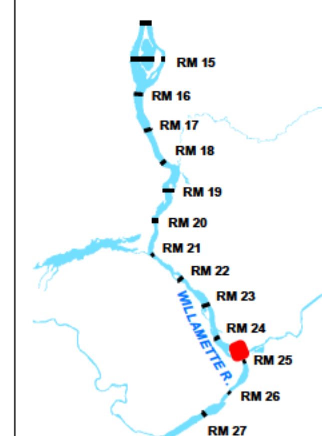


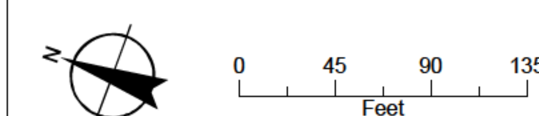
LEGEND

Sample Location
- Successful Manual Grab Sample
- Successful Power-Grab Sample
- Unsuccessful Power-Grab Sample
- Target Sample Location
- DEQ Composite Sample Centroid
- URSC Sample Area

Historical Sampling Location
- Surface Sediment
- Water
- Biological

All Other Features
- River Mile (RM)
- DEQ ECSI Site
- City of Lake Oswego Outfall
- Wastewater Treatment Plant
- Wastewater Treatment Plant Discharge Point (approximate)
- City Limit
- Watercourse
- Waterbody





Notes:
Location information for outfalls beyond what is depicted was not readily available.
URSC = Upriver Reach Sediment Characterization
1. Elevations in feet are relative to Columbia River Datum (CRD), U. S. Army Corps of Engineers, Hydrographic Surveys, 1999

Date: May 7, 2018
Data Sources: BES, METRO, COP

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Document Path: P:\Portland\205 - OR DEQ\026-Upriver Sediment Characterization\Project_GIS\Project_mxds\FDR\Figure9_RM24_7.mxd

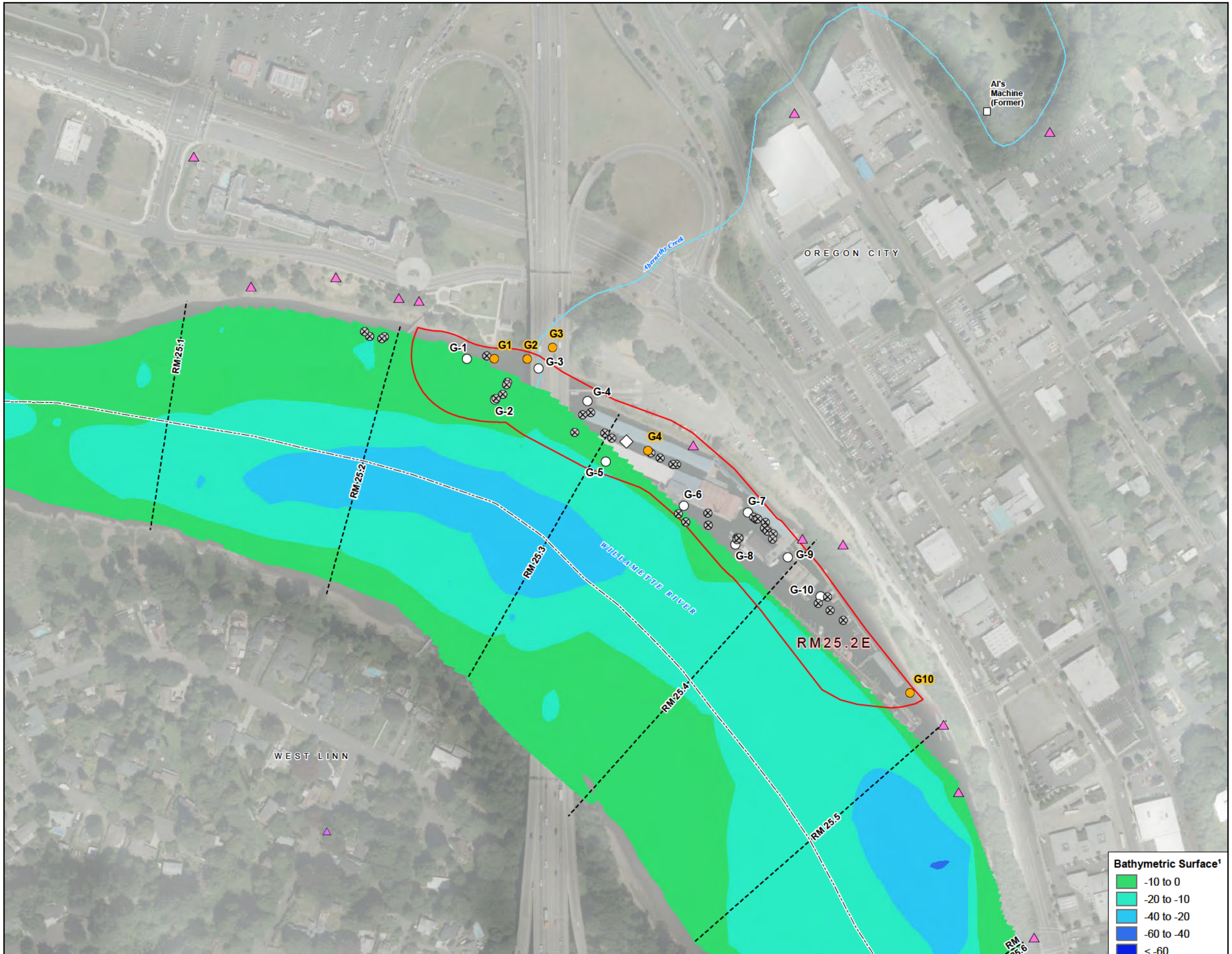
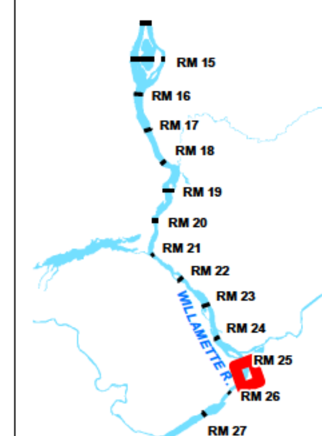


FIGURE 10
RM25.2E
Sediment Sampling Locations
URSC Field and Data Report

LEGEND
Sample Location
- Successful Power-Grab Sample
- Unsuccessful Power-Grab Sample
- Target Sample Location
- DEQ Composite Sample Centroid
- URSC Sample Area

Historical Sampling Location
- Surface Sediment
- Water
- Biological

All Other Features
- River Mile (RM)
- DEQ ECSI Site
- Oregon City Outfall
- Wastewater Treatment Plant
- Wastewater Treatment Plant Discharge Point (approximate)
- City Limit
- Watercourse
- Waterbody



0 130 260 390
Feet

Notes:
Location information for outfalls beyond what is depicted was not readily available.
URSC = Upriver Reach Sediment Characterization
1. Elevations in feet are relative to Columbia River Datum (CRD), U. S. Army Corps of Engineers, Hydrographic Surveys, 1999

Date: May 7, 2018
Data Sources: BES, METRO, COP

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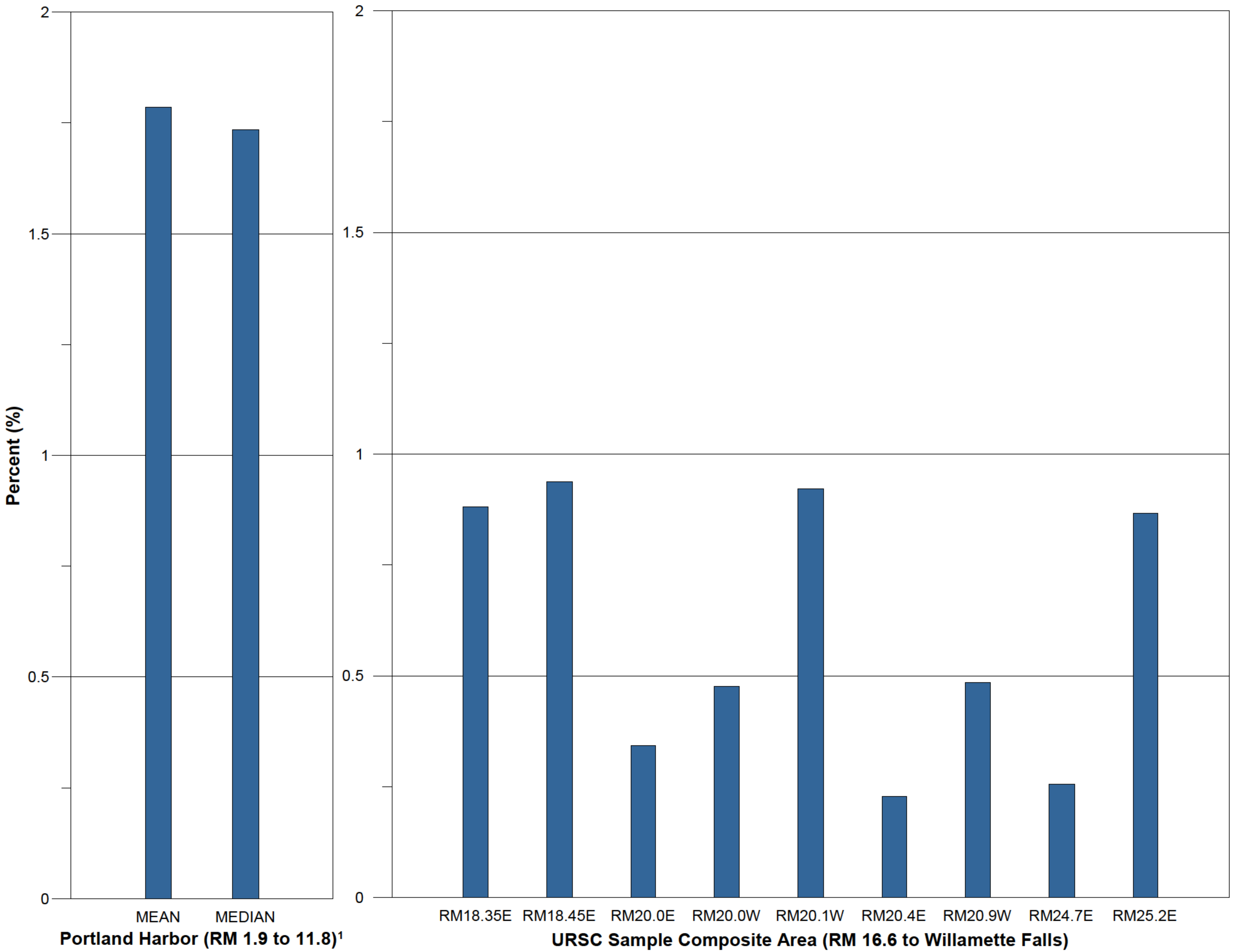

Figure 11
Total Organic Carbon in Surface Sediment

URSC Field and Data Report

Legend

Detected Surface Sediment Result

Notes:

Portland Harbor = Portland Harbor Superfund Site
RM = River Mile
URSC = Upriver Reach Sediment Characterization
[1] Portland Harbor surface sediment statistics derived from Table 5.2-1 of the Portland Harbor Remedial Investigation Report (EPA, 2016a).

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Date Modified: May 2018

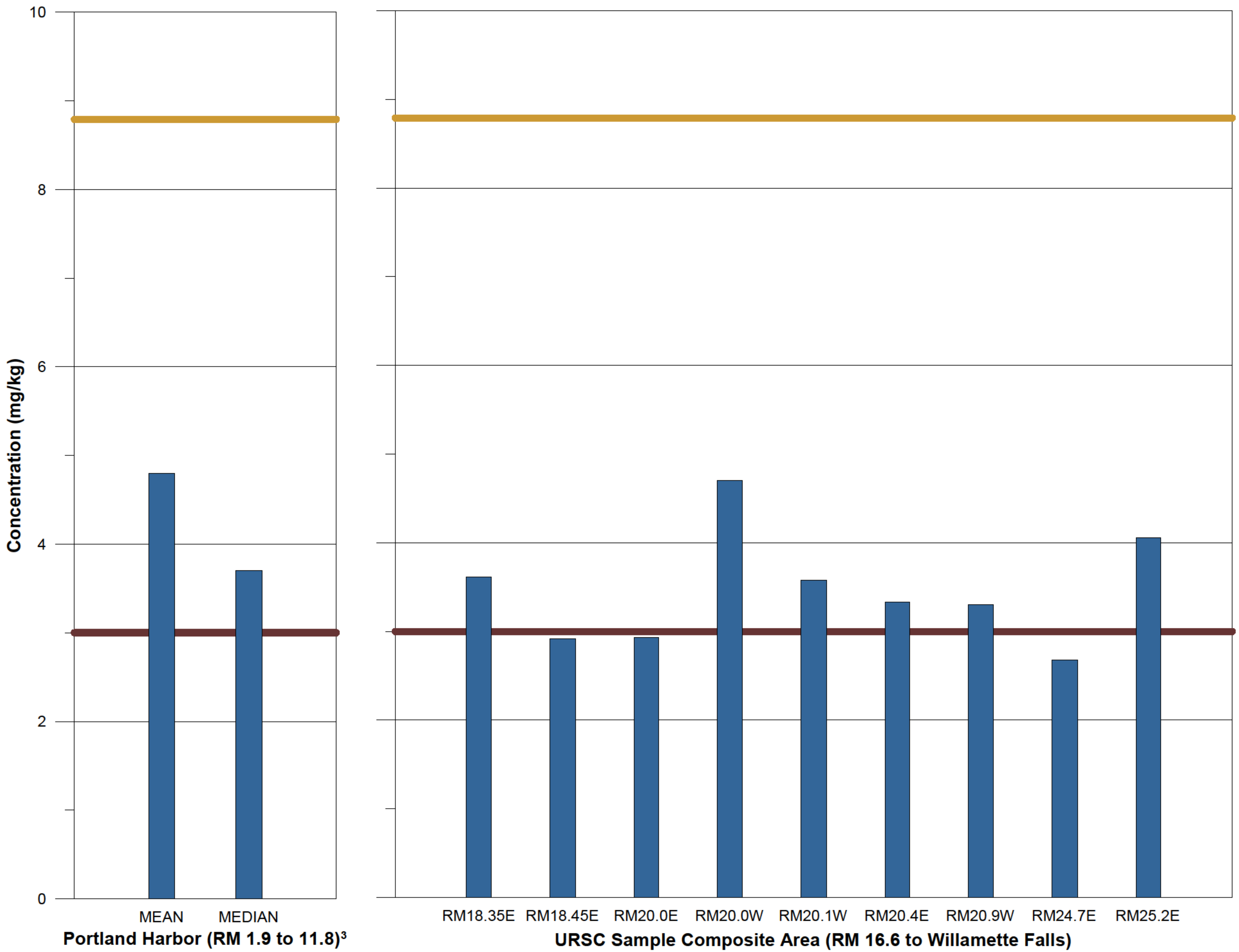

Figure 12
Arsenic in Surface Sediment

URSC Field and Data Report

Legend

Detected Surface Sediment Result

Portland Harbor Cleanup Level[1]

DEQ Soil Background Level[2]

Notes:

DEQ = Oregon Department of Environmental Quality
mg/kg = milligram/kilogram
Portland Harbor = Portland Harbor Superfund Site
RM = River Mile
URSC = Upriver Reach SedimentCharacterization
[1] Portland Harbor Cleanup Level derived from Table 17 of the Record of Decision (EPA, 2017).
[2] DEQ default soil background value for soils in the Portland Basin (DEQ, 2013).
[3] Portland Harbor surface sediment statistics derived from Table 1.2-1 of the Portland Harbor Feasability Study (EPA, 2016b).

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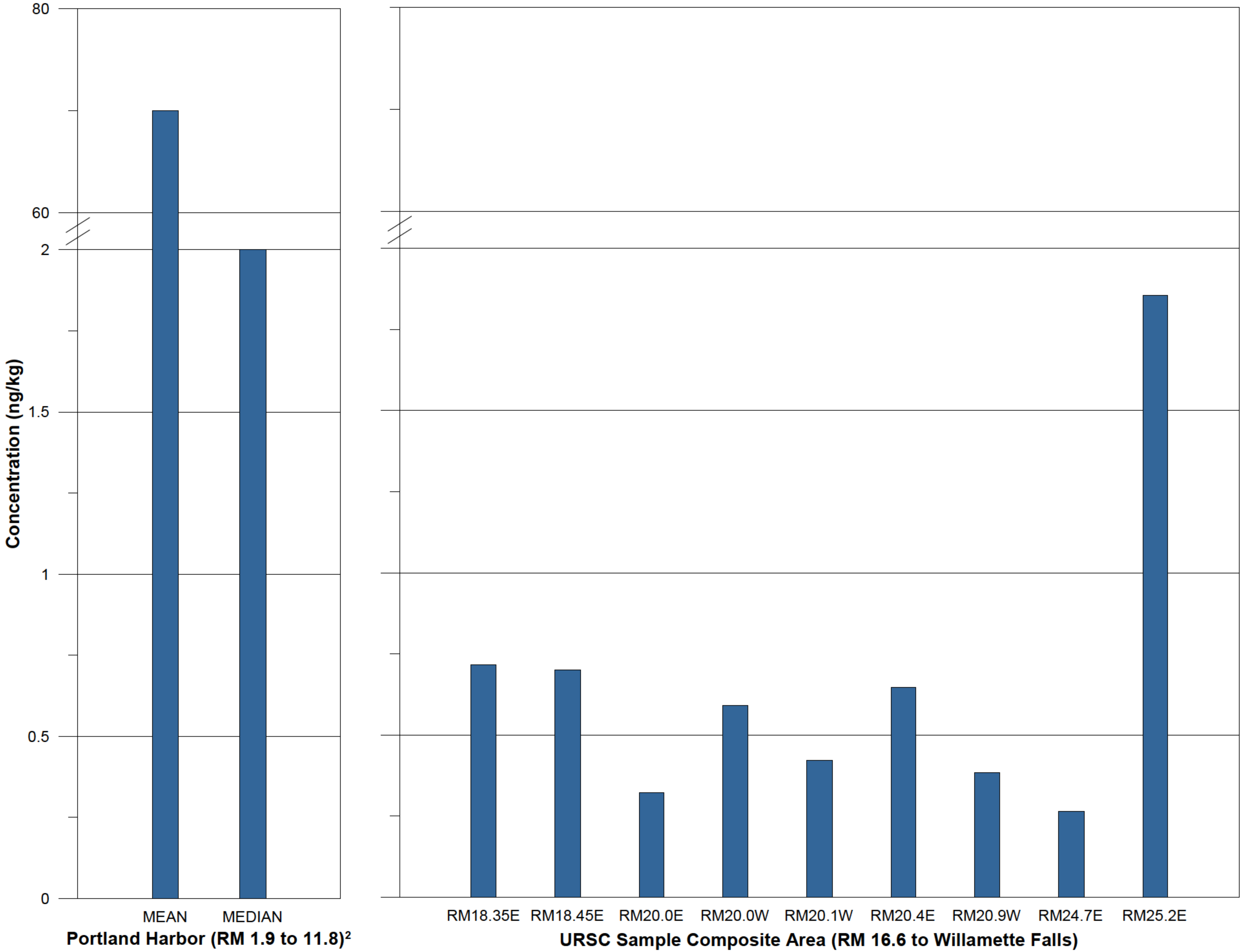

Figure 13
Total Dioxin/Furan TEQ[1]
in Surface Sediment

URSC Field and Data Report

Legend

Detected Surface Sediment Result

Notes:
ng/kg = nanogram/kilogram
Portland Harbor = Portland Harbor Superfund Site
RM = River Mile
URSC = Upriver Reach Sediment Characterization
[1] Total Dioxin/Furan toxicity equivalents (TEQ) were calculated as the sum of each applicable congener concentration multiplied by the corresponding 2005 World Health Organization (WHO) consensus toxic equivalency factor (TEF) value for mammals (Van den Berg et al. 2006).
[2] Portland Harbor surface sediment statistics derived from Table 1.2-1 of the Portland Harbor Feasability Study (EPA, 2016b).

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Date Modified: May 2018

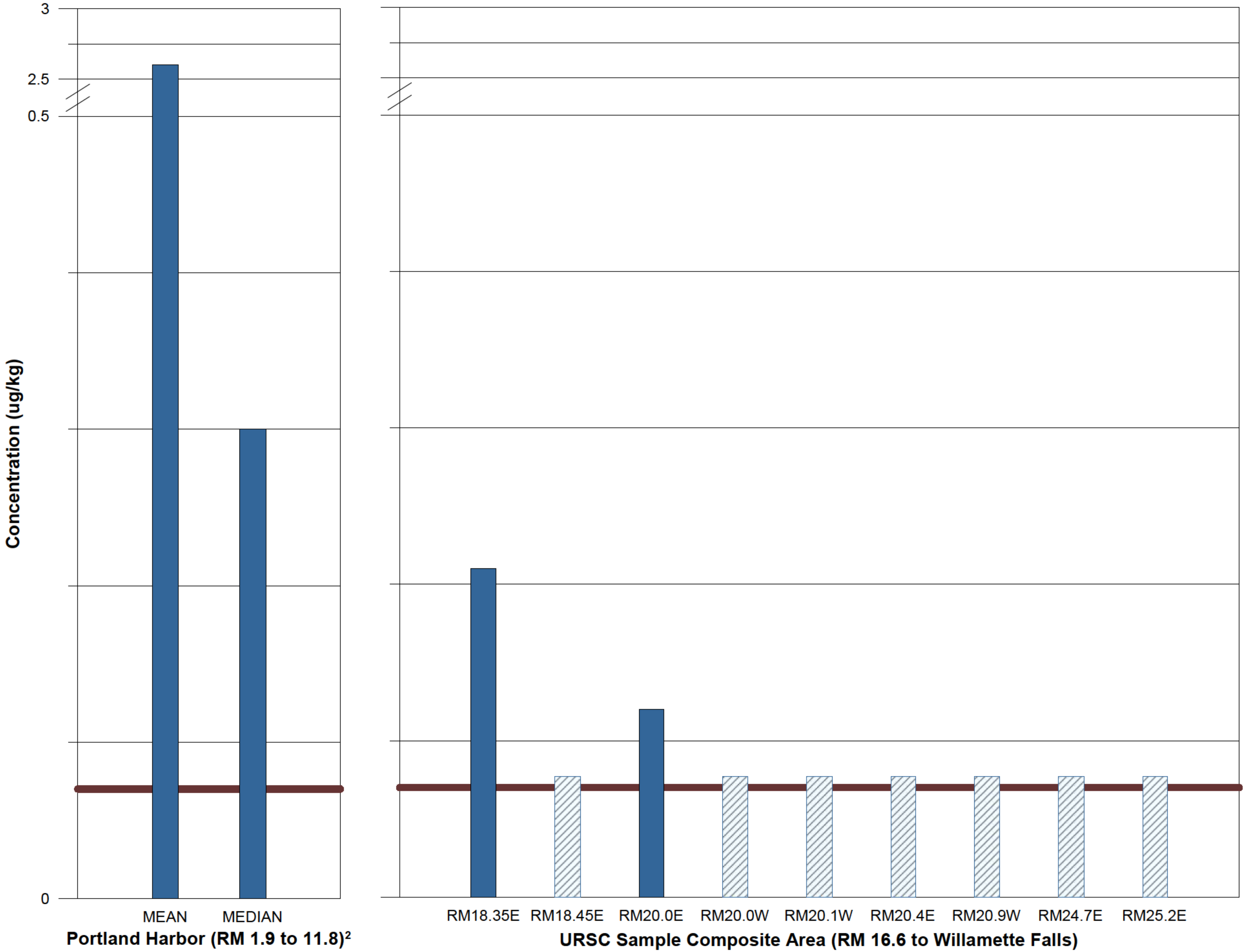

Figure 14
Dieldrin
in Surface Sediment

URSC Field and Data Report

Legend

- Detected Surface Sediment Result
- Nondetected Surface Sediment Result
- Portland Harbor Cleanup Level[1]

Notes:

ug/kg = microgram/kilogram
Portland Harbor = Portland Harbor Superfund Site
RM = River Mile
URSC = Upriver Reach Sediment Characterization
[1] Portland Harbor Cleanup Level derived from Table 17 of the Record of Decision (EPA, 2017).
[2] Portland Harbor surface sediment statistics derived from Table 1.2-1 of the Portland Harbor Feasability Study (EPA, 2016b).

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Date Modified: May 2018

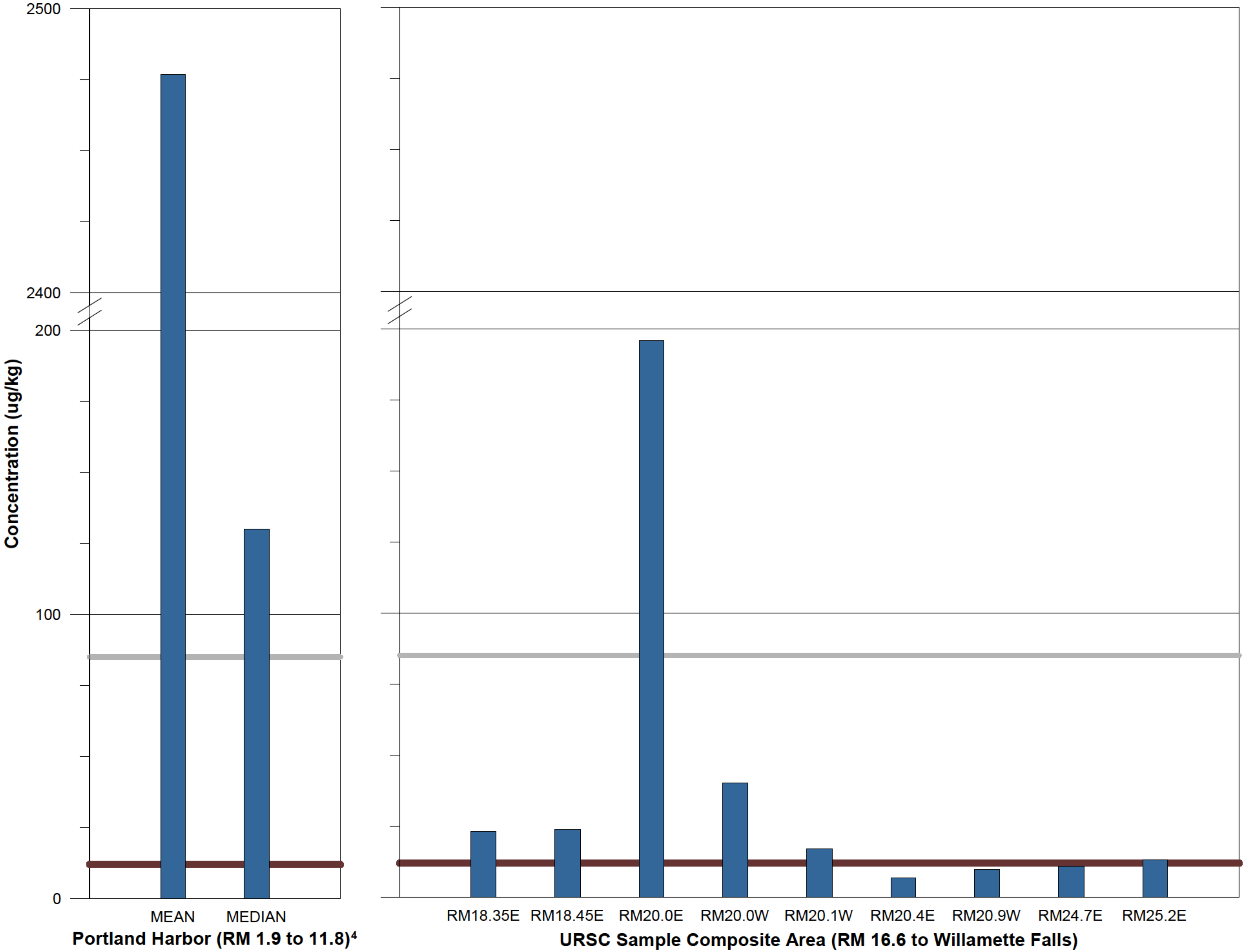

Figure 15
Total cPAH (BaP Eq)[1] in Surface Sediment

URSC Field and Data Report

Legend

- Detected Surface Sediment Result
- IRIS Adjusted Cleanup Levels[2]
- Portland Harbor Cleanup Level[3]

Notes:

BaP Eq = benzo(a)pyrene equivalent
cPAH = carcinogenic PAH
PAH = polycyclic aromatic hydrocarbons
Portland Harbor = Portland Harbor Superfund Site
RM = River Mile
ug/kg = microgram/kilogram
URSC = Upriver Reach Sediment Characterization

[1] Total cPAH is the sum of benzo(a)pyrene (BaP) equivalent (BaPEq) concentrations, which were calculated by multiplying the cPAHs by their respective potency equivalent factors (PEFs).

[2] The toxicity of cPAHs has recently been updated in EPA's Integrated Risk Information System (IRIS). Application of the updated toxicity information results in a risk-based level of 85 ug/kg.

[3] Portland Harbor Cleanup Level derived fromTable 17 of the Record of Decision (EPA, 2017).

[4] Portland Harbor surface sediment statistics derived from Table 1.2-1 of the Portland Harbor Feasability Study (EPA, 2016b).

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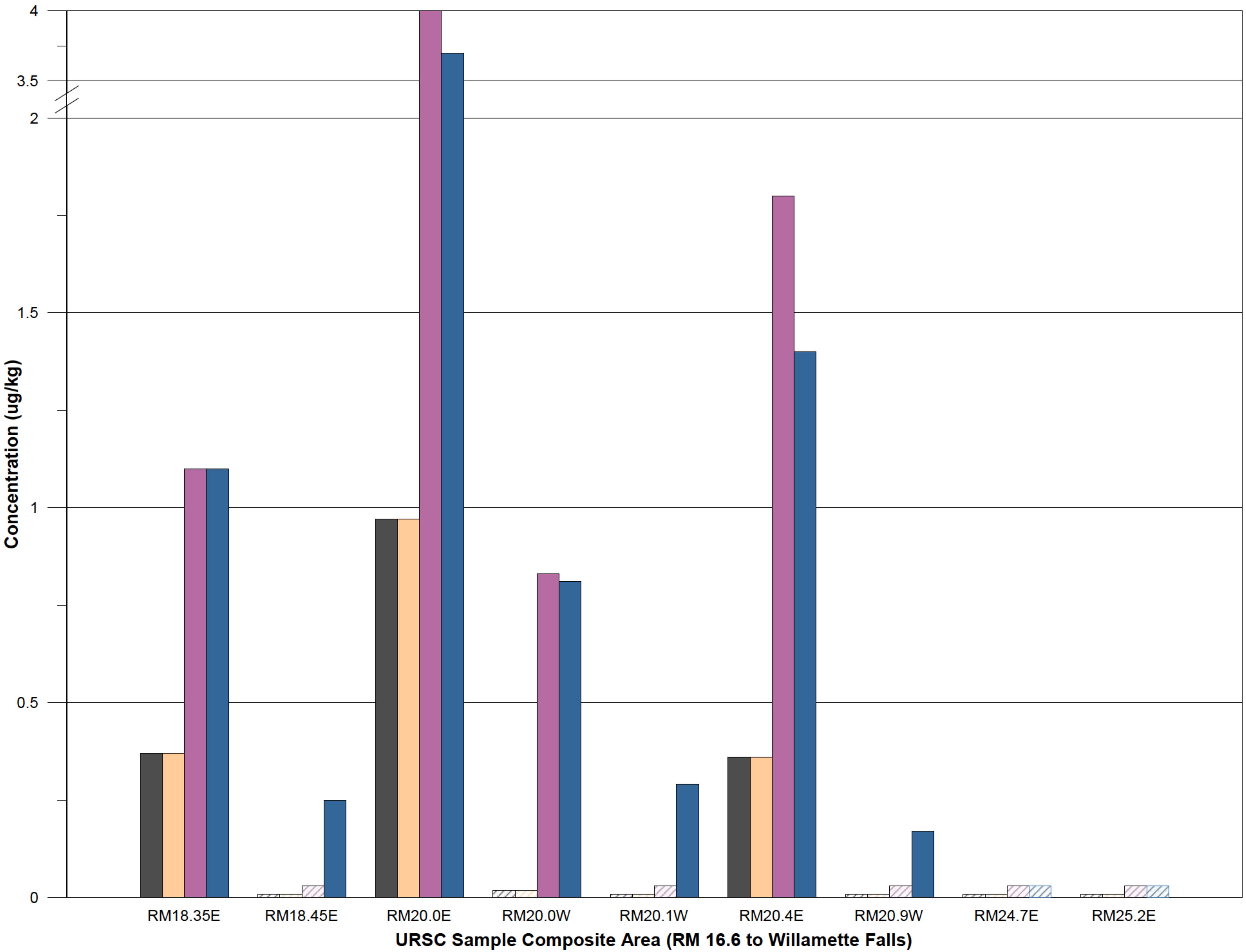

Figure 16
PBDEs 47, 99, 153, and 209 in Surface Sediment

URSC Field and Data Report

Legend

- Detected Surface Sediment- PBDE 47
- Detected Surface Sediment - PBDE 99
- Detected Surface Sediment - PBDE 153
- Detected Surface Sediment - PBDE 209
- Nondetected Surface Sediment - PBDE 47
- Nondetected Surface Sediment - PBDE 99
- Nondetected Surface Sediment - PBDE 153
- Nondetected Surface Sediment - PBDE 209

Notes:
PBDE = polybrominated diphenyl ether
Portland Harbor = Portland Harbor Superfund Site
RM = River Mile
ug/kg = microgram/kilogram
URSC = Upriver Reach Sediment Characterization

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Date Modified: May 2018